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ITANO (A.) & ARAKAWA (S.). **Microbiological investigation of organic manures. I. Decomposition of Rape-cake.**—*Ber. Ohara Inst. Landw. Forsch.*, v, 3, pp. 427-446, 2 graphs, 1933.

A fully tabulated account is given of the writers' investigations on the decomposition of rape cake (a) in soils, and (b) by stock cultures of various micro-organisms. Rape cake [made from *Brassica* (?) napus seeds] is stated to be extensively used in Japan as a manure for tobacco, oranges, and flowering plants.

The addition of rape cake to soil caused a marked increase in the number of bacteria and a still greater increase in the number of actinomycetes present. Ammonification is thought to be brought about chiefly by the latter. Of the twelve fungi grown both in a nutrient medium and in sand, *Aspergillus cellulosa*, *A. oryzae*, *Cladosporium herbarum*, *Trichoderma koningi*, and *Rhizopus nigricans* caused the most extensive decomposition of the rape cake. The first stage in this process appears to be the production of soluble non-protein substance, which undergoes gradual conversion into ammonia culminating in 15 to 20 days, while the maximum amount of soluble total nitrogen is formed in 10 to 15 days.

WILBRINK G[ERARDA]. **Cane diseases resembling leaf scald.**—*Proc. Fourth Congress Internat. Soc. Sugar Cane Technologists*, 1932. [Abs. in *Facts about Sugar*, xxviii, 7, p. 295, 1933.]

Three sets of lesions have been observed in Java on sugar-cane which were at first mistaken for leaf scald [*Bacterium albilineans*: *R.A.M.*, xii, pp. 114, 245] but later found to represent distinct diseases. These are now known as false leaf scald, 'fourth disease' [ibid., xi, p. 4], and wilting of the 'rajoengan'; they are not uncommon on P.O.J. 2878, 2883, and 2961. False leaf scald is characterized by a chlorotic or reddish striping of the leaves, which is found on microscopic examination to be quite different from that due to true leaf scald. No causal agent has been detected and the disorder does not appear to be of economic importance.

'Fourth disease' is prevalent on the P.O.J. varieties of Kassoer extraction and combines the features of sereh, leaf scald, and root

rot. Here again the disturbance appears to be of physiological origin and of no great significance under normal conditions.

Wilting of the 'rajoengan' occurs in canes topped to stimulate the shooting of the buds for planting purposes. The disease does not seem to be transmissible and no causal organism has been found associated with it.

CROSS (W. E.). **Una misión importante de la Estación Experimental es la de evitar las epidemias en la Caña.** [An important function of the Experiment Station is to prevent Cane epidemics].—*Rev. Indust. y Agric. de Tucumán*, xxiii, 1-2, pp. 27-31, 2 figs., 1933.

An important part of the work of the Tucumán Experiment Station consists in preventing the introduction into the Argentine Republic of epidemic diseases of sugar-cane. The only major disorder of this crop so far known to occur in the country is mosaic [*R.A.M.*, xii, p. 463], and growers are urged to co-operate with the agricultural experts in maintaining the exclusion of such dreaded scourges as gummosis [*Bacterium vascularum*], sereh disease, leaf scald [*Bact. albilineans*], and Fiji disease, chiefly by the sole use of home-grown cane for planting and the immediate notification of the Station authorities in the case of any suspicious symptoms.

TUCKER (C. M.). **The distribution of the genus *Phytophthora*.**—*Missouri Agric. Exper. Stat. Res. Bull.* 184, 80 pp., 1933.

This is an annotated list, arranged in alphabetical sequence of the natural order of the host, of all the species of *Phytophthora* which have been recorded in literature to occur on 216 species (in 149 genera and 67 families) of cultivated and wild plants. It also includes 82 additional species (45 genera and 6 families), on which the fungi have been successfully inoculated. Most of the *Phytophthora* species are recorded under the names reported by their authors, except when the non-validity of such names has been clearly established [cf. *R.A.M.*, x, p. 754].

The bulletin terminates with a bibliography covering 524 titles and a page index of the hosts mentioned.

WEBER (G. F.). **Occurrence and pathogenicity of *Nematospora* spp. in Florida.**—*Phytopath.*, xxiii, 4, pp. 384-388, 1 fig., 1933.

In 1926 *Nematospora coryli* [*R.A.M.*, xii, p. 8] was isolated from sweet pepper [*Capsicum annuum*] pods near Miami, Florida, and in 1932 the same fungus was detected on Satsuma oranges [*Citrus nobilis* var. *unshiu*] by H. S. Fawcett and on grapefruit, oranges [*ibid.*, viii, p. 717], and tomatoes [*ibid.*, v, p. 390] by the writer. *N. gossypii* [*ibid.*, xi, p. 572] was isolated once from a Satsuma orange, causing exactly the same symptoms as *N. coryli*, viz., local desiccation and wrinkling of the rind, slight protrusion of the oil glands above the surface, and a whitish spotting of the locule covering, which in advanced cases may show a reddish-brown

discoloration accompanied by loss of moisture and collapse of the juice sacs.

The tomatoes infected by *N. coryli* showed 'cloudy spots' or light-coloured areas scattered over the surface. The affected tissues were somewhat pithy, as though moisture had been withdrawn and the spaces filled with air. The diseased portions ripened less rapidly than the healthy ones, leaving green islands in a green or red fruit. As the infection spreads the green spots darken, become sunken and soft, and are finally invaded by secondary soft-rotting organisms.

Cross-inoculation experiments showed that both species of *Nematospora* are pathogenic to oranges, tangerines, and tomatoes. *N. coryli* from tomato appeared to cause more rapid infection of Satsuma oranges and tangerines than the orange strain, but on tomato there was little difference in the effect of the two strains, both of which produced colonies in the seed cavities with resultant discoloration of the seeds. The multiplication of the organisms was much more rapid in tomatoes than in oranges or tangerines. The development of *N. gossypii* in tomatoes differed from that of *N. coryli* in the extensive spread of the mycelium through the host, even among the hairs of the seeds. Ascospores of both species developed profusely in diseased fruits. *N. gossypii* was less reliable in inoculation experiments than *N. coryli*.

This is stated to be the first record of *N. gossypii* in the United States, of its occurrence on orange, and of *N. coryli* on pepper in the United States.

WEHMEYER (L. E.). **The British species of the genus *Diaporthe* Nits. and its segregates.**—*Trans. Brit. Mycol. Soc.*, xvii, 4, pp. 237-295, 1933.

This is a systematic account of the British species of *Diaporthe*, *Diaporthopsis*, *Apioportha*, and *Cryptodiaporthe*, and is based on a considerable collection of specimens together with such published exsiccata as have been examined by the author in preparation for his monograph of the genus *Diaporthe* [which is in the press].

In addition to a description of the perithecial stage, reference is made to any imperfect stages that have been established by cultures or have been suggested in literature.

Of the 23 recognized species of *Diaporthe*, attention should be drawn to the author's treatment of *D. eres* Nits. (the type species of the genus) which he provisionally recognizes on a number of conifers, and on some 18 genera of broad-leaved woody plants. The species, as here treated, represents some 50 specific names in systematic literature.

JENKINS (ANNA E.). **Application of the terms 'anthracnose' and 'scab' to plant diseases caused by *Sphaceloma* and *Gloeosporium*.**—*Phytopath.*, xxiii, 4, pp. 389-395, 1 fig., 1933.

The term 'anthracnose' was originated in 1853 by Fabre and Dunal for a grape disease in order to avoid the use of the word 'charbon', commonly applied in France to a cereal smut. The new name for the grape disease was used only in a symptomatic sense. The anthracnose pathogen was later described as *Sphace-*

loma ampelinum and is now classified in its perfect stage as *Elsinoe ampelina* [R.A.M., ix, p. 66]. F. L. Scribner (Rept. Commissioner, U.S. Dept. of Agric., 1887, p. 323, 1888) extended the term anthracnose to denote the related bramble disease caused by *Gloeosporium venetum*, now known in its perfect stage as *E. veneta* [R.A.M., xi, p. 724]. He also applied the name to the unrelated disease of beans (*Phaseolus*) [*vulgaris*] caused by *Colletotrichum lindemuthianum*, and there are various other instances in which anthracnose has been used in an etiological sense to designate disturbances due to fungi of the above-named and a few other genera [cf. *ibid.*, x, p. 669; xii, p. 95]. Some of these diseases, both hyperplastic and non-hyperplastic, have also been called 'scab'.

It is suggested that, in naming new fungous diseases, the terms 'anthracnose' and 'scab' should be applied in a symptomatic sense, the former for necrotic and hypoplastic disorders with somewhat restricted lesions, as in bean anthracnose, and the latter for hyperplastic infections with scab-like spots, e.g., citrus scab (*Sphaceloma*) [*fawcettii*].

HIRATSUKA (N.). **Additional notes on the Melampsoraceae of Hokkaido. II.**—*Trans. Tottori Soc. Agric. Sci.*, iv, 2, pp. 111–115, 1932.

A supplementary annotated list is given of 15 fungi of the Melampsoraceae collected in Hokkaido, Japan, up to 1932 [R.A.M., viii, p. 268; xi, p. 405]. *Chrysomyxa alpina* is recorded on leaves of *Rhododendron chrysanthum*.

HIRATSUKA (N.). **Studies on *Uromyces fabae* and its related species.**—*Japanese Journ. of Botany*, vi, 3, pp. 329–379, 2 pl., 1933.

As a result of comparative morphological studies [which are discussed in detail and tabulated] on *Uromyces fabae* [R.A.M., xi, p. 431], *U. orobi*, and *U. ervi* on 13 species of *Vicia*, the three species of *Uromyces* are maintained. The hosts of *U. fabae* are *V. amoena* var. *sachalinensis*, *V. cracca* var. *japonica*, broad bean (*V. faba*), *V. japonica*, *Lathyrus maritimus*, *L. palustris* var. *lineaeifolius*, and peas [*ibid.*, x, p. 343]; those of *U. orobi*, *V. nipponica* var. *capitata*, *V. unijuga*, and *L. davidii*; and those of *U. ervi*, *V. hirsuta*, *V. sativa*, and *V. tetrasperma* [*V. gemella*].

On the basis of cross-inoculation experiments *U. fabae* was subdivided into three physiologic forms, namely, f.sp. *viciae-fabae* on broad beans and peas only, f.sp. *pisi-sativi* confined to peas, and f.sp. *lathyri-maritimi* infecting *L. maritimus* alone.

U. orobi falls into two physiologic forms, viz., f.sp. *viciae-nipponicae* and f.sp. *viciae-unijugae*, the former restricted to *V. nipponica* var. *capitata* and the latter to *V. unijuga*.

Cross-inoculation tests with *U. ervi* on *V. hirsuta*, *V. sativa*, and *V. gemella* (the only species liable to infection) failed to yield any evidence of physiologic specialization. This rust forms a succession of aecidia in the course of its life-cycle and from these uredosori and teleutosori may be produced in greater or lesser abundance; the uredo stage may be omitted when conditions are unfavourable.

U. fabae has been found very widely distributed in Japan from south Saghalien to Formosa. *U. orobi* occurs in Hokkaido, Honshû, and Shikoku, while *U. ervi* is apparently restricted to the southern districts: south Honshû, Shikoku, and Kiushû.

GADD (C. H.). **Report of the Mycologist for the year 1932.**—*Tea Res. Inst. Ceylon Bull.* 10 (*Ann. Rept. for the year 1932*), pp. 17–26, 2 graphs, 1933.

Early in the period under review witches' broom of tea [*R.A.M.*, xi, p. 749] became prevalent throughout the Kandapola district of Ceylon, followed by a marked recovery in May. In other fields the disease steadily became worse. These observations are considered to support the view that the disease indicates a derangement in the life processes of the bushes not necessarily of the same causation in every case. The witches' broom disease closely resembles yellows of tea in Nyasaland [*ibid.*, xii, p. 537] in its secondary symptoms, but differs from it in that leaf yellowing is generally absent.

In an attempt to devise a suitable laboratory test of the disinfectant value of various paints used on wounds and pruning cuts in tea bushes (through which wood-rotting organisms effect an entry and cause unsightly cankers in the branches) blocks of wood after being soaked in water and sterilized were painted with various preparations and exposed to attack (in flasks) by *Irpex destruens* [*ibid.*, iii, p. 4]. One set of blocks painted with each disinfectant was placed in running water for about two months before being inoculated, another was first exposed to the weather for a similar period, and the third was inoculated as soon as the paint was dry. The [tabulated] results obtained (by measuring the percentage losses in dry weight) indicated that the most effective preparations were white lead, cargillineum B [*ibid.*, viii, p. 599], and solignum. In almost every case exposure to the weather lowered resistance more than washing and in a good many the washing was better than immediate inoculation after painting. Some improvement in the technique of the experiment is necessary before truly comparable results can be obtained.

C. (J. H.). **Tea cider.**—*Planters' Chron.*, xxviii, 5, p. 108, 1933.

Tea cider is prepared by adding about $2\frac{1}{2}$ oz. of tea to 1 gall. water, bringing to the boil, and adding, when the infusion has cooled, $\frac{1}{2}$ lb. sugar. The brew is then poured into an earthenware jar, a little of the tea culture [*Bacterium xylinum* and *Saccharomycodes ludwigii*: *R.A.M.*, xii, p. 249] is added, and primary fermentation is allowed to continue until the critical taste-point is reached. The period of this primary fermentation depends on climatic conditions and ranges from three or four days to (in dull weather) three weeks. At the critical taste-point, the beverage is bottled and a drop of culture added before corking. The beverage contains 3.5 per cent. alcohol, can be sold (exclusive of duty) at well under two annas [about 2d.] per bottle, and can be made with a wide range of sweetness.

MATSUMOTO (S.) & SOMAZAWA (K.). **Immunological studies of mosaic diseases. III. Further studies on the distribution of antigenic substance of Tobacco mosaic in different parts of host plants.**—*Journ. Soc. Trop. Agric.*, Formosa, v, pp. 37-43, 2 figs., 1933.

Continuing their studies on the distribution of the tobacco mosaic antigen in different parts of the host [*R.A.M.*, xii, p. 43], the writers performed the following experiments. The stems of twenty healthy tobacco plants, previously defoliated except for a few young leaves, were 'ringed' in the middle of an internode some way from the ground, the external tissue of the ringed lesions [presumably down to the cambium] being scraped with a red-hot scalpel; ten of the plants were then inoculated with the mosaic virus above the lesions and ten below. The results of this test showed that the antigenic substance (probably infective principle) travels freely both upwards and downwards through the lesion. In another experiment healthy tobacco plants were ringed as described above, a small square hole made through the xylem of the ringed area, and the central tissue scraped out through the hole with a red-hot knife, so that the sole organic connexion between the upper and lower portions of the plant was through the xylem ring. After 10 to 13 days, the tops of the plants inoculated above the ring exhibited distinct mosaic symptoms, though in no case was any infection observed following inoculation with the root extracts. On the other hand, where the inoculations were made below the lesion, positive results were obtained only in the tissues on the site of inoculation, neither mosaic symptoms nor antigenic reaction being apparent in the upper portions of the plant. No evidence is forthcoming, therefore, of the migration of the virus through the xylem.

In order to ascertain whether the xylem of mosaic plants ordinarily contains the antigen, the juices were separately expressed from the cortex (to the cambium), xylem, and central portion of some large mosaic plants and tested for precipitation with the immune sera. Each of the tissues was thoroughly washed in sterilized water and care was taken to avoid contamination with the virus during manipulation. From the results [which are tabulated] of these trials the authors conclude that the xylem as well as the other tissues contains the antigenic substance. A further test was carried out to determine whether the infective principle can enter the xylem directly through the unbroken cell walls or if mechanical injury of the vessels is necessary to effect penetration. Infection of the cortex, xylem, and pith was effected both through surface wounds made by rubbing and through pin pricks through the xylem, from which it appeared that the virus freely enters the uninjured xylem and passes thence into the central portion of the plant.

FUKUSHI (T.). **On some properties of the Tobacco mosaic virus:**
I.—*Japanese Journ. of Botany*, vi, 3, pp. 381-392, 1933.

The tobacco mosaic virus was experimentally shown, at the Hokkaido (Japan) Botanical Institute, to be readily adsorbed by

kaolin, aluminium oxide, and aluminium hydroxide, added in the proportion of 10 to 20 per cent. to the filtered juice of diseased leaves. Aluminium hydroxide gel also proved effective as an adsorbent of the virus, whereas siliceous earth was of little value in this respect. Kaolin adsorbed the virus more readily in filtered juice with an acid reaction (below P_H 6.0). The virus adsorbed by the kaolin was freed from the latter by dilute ammonia solution and regained its virulence, as shown by inoculation tests on young tobacco plants, when the solution was adjusted to a slightly acid reaction. The recovered virus gave 40 to 90 per cent. successful infections compared with 100 per cent. with the original virus in filtered juice at P_H 4 to 7. The virulence of the latter was diminished by increasing the acidity or alkalinity beyond these limits.

KOSTOFF (D.). **Virus diseases causing sterility.**—*Phytopath. Zeitschr.*, v, 6, pp. 593–602, 7 figs., 1933.

Certain abnormalities of the reproductive organs, accompanied by slight modifications in growth habit, were observed at the Leningrad Academy of Sciences during the summers of 1930 and 1931 in *Nicotiana tabacum* and some of its hybrids as well as in the cross *N. paniculata* \times *N. langsdorffii*. The ovaries of the affected plants were swollen and elongated, and the length of the styles much curtailed. Growth was arrested and the leaves were slightly smaller and more numerous than in healthy plants. The diseased plants (both pure line and hybrid) were sterile, even when pollinated with pollen from normal individuals, but when normal tobacco plants were pollinated with pollen from diseased ones, viable seeds were obtained that developed into normal plants.

In order to determine whether the symptoms under observation were transmissible from affected to healthy plants, a series of grafting experiments was carried out. The normal shoots of tobacco and *N. langsdorffii* grafted on affected tobacco developed the above-mentioned symptoms in 20–40 days, whereas *N. glauca* subjected to the same treatment remained apparently quite healthy. Normal tomato shoots made very poor growth on affected tobacco stocks, and therefore one scion was cut off 25 days after the initial grafting and grafted back on a healthy tomato plant, the branches of which, 20 to 25 days later, began to show definite symptoms of sterility. The floral calyces were immensely elongated, the flowers sterile, the carpels of the young fruits broke, and the seeds failed to develop; the leaves were abnormally brittle. Normal tobacco plants on which shoots from affected tobacco were grafted showed the symptoms in 25 to 35 days. Even when attacked in an advanced stage, the capsules produced non-viable seeds. Healthy *N. glauca* stocks on which diseased tobacco shoots were grafted continued to grow normally, but *N. langsdorffii* developed the typical sterility symptoms 25 to 35 days after grafting. Pronounced effects followed the grafting of affected tobacco on *D. stramonium*. In the case of *D. wrightii* and tomato stocks on which affected tobacco shoots were grafted, both stocks and scions made very poor growth but did not contract the symptoms under discussion. *N. glauca*, as mentioned above, showed no sign of sterility but was proved by grafting experiments with tobacco,

N. rustica, and *N. langedorffii* shoots to carry the infective agent, which it transmitted to the scions.

No bacteria or fungi being detected in affected ovaries, the author attributes the symptom to a virus which he terms 'female sterility virus'. Similar symptoms were recently described by V. Ghimpu in a study on teratological phenomena (*Rev. Path. Vég. et Ent. Agric.*, xviii, pp. 289-295, 7 pl., 1931).

Some observations are made on the partial sterility of tobacco caused by mosaic, in which up to 48 to 50 per cent. of abortive pollen was recorded. In 1931 the writer described (*Sci. Publ. Bulgar. Agric. Soc.*, 28, p. 1) a virus disease causing sterility of plum trees through degeneration of the ovules.

STAPP (C.). **Über die experimentelle Erzeugung von Wildfeuer bei Tabak.** [On the experimental production of wildfire in Tobacco.]—*Angew. Bot.*, xv, 2, pp. 225-238, 2 figs., 1933.

A detailed account, accompanied by tables, is given of the writer's method for the artificial inoculation of tobacco with wildfire (*Pseudomonas tabaci*) [*Bacterium tabacum*] in Germany [*R.A.M.*, x, p. 629] with a view to the development of resistant varieties.

The highly susceptible selection of the Havana Original OR 44 supplied by the Genetic Research Institute, Müncheberg (Mark Brandenburg) was used for the purpose of control tests, while the Saalburger and Maurath varieties and the selection L 1924 B.R.A. were also included. Neutral beer wort agar was used as the culture medium, and inoculations with an emulsion from this source gave up to 45 per cent. infection. Even better results (95 per cent.) were attained, however, by the inoculation of young seedlings with an emulsion of the organism in the expressed sap of tobacco plants, the surface tension of which is considerably lower than that of tap water, beer wort, and various other solutions tested. The seedlings were sprayed by means of an atomizer, great care being taken to reach the under sides of the leaves. The newly infected frames must be kept at a relative humidity of 85 to 95 per cent. and a temperature of 20° to 22° C., which may be gradually adjusted to 60 per cent. and 18° to 25°, respectively.

The first chlorotic lesions appear about the sixth day after infection, or in very severe cases wilting may begin on the eighth to tenth day without any preliminary signs. Sometimes the leaves assume a transparent aspect like that of tissue paper, and in other cases the chlorosis seems to be arrested, so that the second pair of leaves develop normally and the plant survives.

GEORGEVITCH (P.). **Bakterioza slavonskich Hrastova.** [Bacteriosis of Slavonic Oaks.]—*Mitt. Inst. Forstwissensch. Forsch.*, Belgrade, 1932, pp. 1-15, 2 pl., 1932. (Serbo-Croatian.) [Abs. in *Neuheiten auf dem Geb. des Pflanzensch.*, xxvi, 3, p. 55, 1933.]

A coccobacillus was isolated and grown in pure culture from the slimy-granular masses obstructing the vessels of the discoloured sapwood of oak trunks and roots in Slavonia (Jugo-Slavia). The foliage of diseased leaves turns yellow and shrivels. The newly discovered organism is believed to be only one of the causes of the

devastating losses among the oak plantations affected by 'dying-off' [*R.A.M.*, ix, p. 278; x, p. 277].

TEHON (L. R.) & JACKS (W. R.). **Smooth patch, a bark lesion of White Oak.**—*Journ. of Forestry*, xxxi, 4, pp. 430-433, 4 figs., 1933.

White oaks (*Quercus alba*) in Illinois are liable to show more or less extensive, smooth, apparently sunken patches of a paler grey than the rest of the bark, due to infection by *Aleurodiscus oakesii*, which has also been reported on *Ostrya virginiana*, *Carpinus caroliniana*, willows, hickories, and elms. The phloem and cambium below the lesions are not invaded, the limit of penetration of the fungus being sharply marked by a distinct blackening of the tissues. The affected areas are readily loosened from the bark and flakes of tissue drop from the tree or are torn off by the wind. Thus the thickness and inherent resistance of the natural protective layer are greatly diminished, leaving the tree exposed to the possibilities of mechanical injury and attack by wood-destroying fungi.

GRAVES (A. H.). **Forest pathology.**—*Twenty-second Ann. Rept. Brooklyn Bot. Gard.*, 1932 (*Brooklyn Bot. Gard. Record*, xxii, 2), pp. 57-63, 1 fig., 1933.

Further notes are given on the experiments in progress on the hybridization of the Japanese chestnut (*Castanea crenata*) with the American (*C. dentata*) and a variety of *C. sativa*, with a view to developing a race resistant to blight [*Endothia parasitica*: *R.A.M.*, x, p. 566].

MORRIS (R. T.). **A hitherto unreported blight of the Juglandaceae.**—*Phytopath.*, xxiii, 4, pp. 407-408, 1933.

In the writer's arboretum at Stamford, Connecticut, a hitherto apparently unreported blight attacked the anthers of a number of Juglandaceae in 1932, the species affected including the English walnut (*Juglans regia*, Webb variety), butternut (*J. cinerea*) with its hybrids and parthenogens, five cultivated varieties of the black walnut (*J. nigra*), several of the Japanese (*J. sieboldii*), *J. sinensis*, *J. sibirica*, pecan (*Hicoria* [*Carya*] *pecan*), and *H. [C.] ovalis*. The anthers were attacked when almost ready to shed pollen and on any given tree were often blackened and destroyed in a single night though sometimes the process extended over two or three nights. G. P. Clinton, plant pathologist at the Connecticut Agricultural Experiment Station, expressed the opinion that the disease was bacterial in origin. Towards the end of August, when the walnut trees should have been laden with nuts, many bore no fruit at all while others had a few clusters apparently resulting from local pollination.

SCHUSTER (C. E.) & MILLER (P. W.). **A disorder of Persian (English) Walnuts grafted on Black-Walnut stocks, resulting in girdling.**—*Phytopath.*, xxiii, 4, pp. 408-409, 1933.

Since 1924 Persian (English) walnuts [*Juglans regia*] of the Franquette variety grafted on black walnut (*J. [californica* var.]

hindsii) in the Willamette Valley, Oregon, have suffered from a disorder characterized by poor shoot growth, premature defoliation, and girdling at the graft union preceded by the development of water-soaked, chocolate-coloured spots in the bark of the stock below. The affected trees usually die about three years after the first symptoms are observed on the aerial parts. The newly formed xylem tissues of the English scion apparently fail to unite with those of the stock, and a dark layer of corky consistency, up to $\frac{1}{4}$ in. thick, is formed between the two kinds of wood, the entire circumference of the tree being finally involved. The disturbance is evidently of a physiological character since no infectious micro-organisms have been found in the discoloured tissues.

FINCH (A. H.) & KINNISON (A. F.). **Pecan rosette: soil, chemical, and physiological studies.**—*Arizona Agric. Exper. Stat. Tech. Bull.* 47, pp. 407–442, 12 figs., 1933.

A fully detailed and tabulated account is given of the writers' studies on pecan [*Carya pecan*] rosette [*R.A.M.*, xii, p. 339] in Arizona, where the disease was found not to be correlated with the total soluble salt content or hydrogen-ion concentration of the soil. Somewhat variable symptoms characterize the disturbance in different varieties: leaf 'burning' or die-back being commonly observed in Success, Schley, Stuart, and others; chlorosis and crinkling in Burkett; while chlorosis and malformations with little burning are typical of affected Kincaid, Halbert, and Money-maker. Rosette has been present in Arizona for over twenty years, leading to the abandonment of pecan orchards in the Santa Cruz, Casa Grande, Salt River, Mohawk, Safford, and South Gila valleys.

Severely rosetted trees produced healthy growth following the injection of soluble zinc salts (chloride and sulphate) in a dry form into holes in the trunk at the rate of 2 to 4 gm. per hole, as well as by similar treatment with a 1 per cent. solution of zinc chloride. An improvement was also noticeable in the condition of young leaves dipped in zinc chloride or zinc sulphate at varying strengths up to 1 per cent., some benefit also being derived from iron sulphate used in the same way, possibly due to its 1 per cent. zinc content [cf. *ibid.*, xii, p. 99]. Chemical analyses revealed the following total zinc and iron contents in healthy and rosetted trees, expressed in percentages of dry matter: (1) healthy, Yuma valley, 0.0356 zinc, 0.1509 iron; (2) healthy, South Gila valley, 0.00203 and 0.01565; (3) treated, South Gila valley, 0.00278 and 0.03511; (4) rosetted, same locality, 0.00035 and 0.05450. The topmost parts of a healthy tree in an area where rosette is prevalent contained less zinc than those from a comparable tree in a district essentially free from the disease. It was further ascertained that zinc is present in the irrigation waters of areas free from rosette, and absent from those in which the disease is serious. The zinc treatments were most efficacious on trees making rapid growth, and their success on older ones is questionable; in such cases pruning of the upper parts to stimulate new growth may be necessary.

TOGASHI (K.) & UCHIMURA (K.). **A contribution to the knowledge of parasitism of *Valsa paulowniae*, in relation to temperature.**—*Japanese Journ. of Botany*, vi, 3, pp. 477–487, 4 graphs, 1933.

Studies were made on the pathogenicity of *Valsa paulowniae* to *Paulownia tomentosa* with reference to the temperature relations of the fungus under natural conditions in northern Japan.

The minimum, optimum, and maximum temperatures for the growth of the fungus in culture were found to be below 5°, 22° to 27°, and 30° to 32° C., respectively; above the optimum the growth increments promptly decreased, whereas at lower temperatures (above 10°) development became more profuse with age. *V. paulowniae*, therefore, like *V. japonica* [*R.A.M.*, xi, p. 60], evidently flourishes at low temperatures, in contrast to the relatively thermophilous *V. mali* [*ibid.*, iv, p. 612] and *Leucostoma persoonii*.

In northern Honshû and in Hokkaido *V. paulowniae* causes a serious die-back of *P. tomentosa*, the temperature fluctuations in the tissue of which exactly coincide with the requirements of the fungus. *V. paulowniae* has also been reported from the more southerly regions of Japan, but the conditions there are not so favourable for its development and spread.

GARD (M.). **Quelques points d'histoire relatifs à la maladie du Pin maritime (*Pinus pinaster* Sol.). Programme d'expériences.** [Some historical data concerning the disease of Maritime Pine (*Pinus pinaster* Sol.). Programme of experiments.]—*Rev. Path. Vég. et Ent. Agric.*, xx, 3, pp. 128–133, 1933.

From a review of the work so far done on the serious dying-off of maritime pines (*Pinus pinaster*) [*P. maritima*] in the south and south-west of France the author concludes (a) that it is of fungal origin, and (b) that the spread of the disease is effectively prevented by deep trenches dug around existing centres of infection. Many points in the etiology of the trouble are as yet obscure, however, and a plan is outlined for the further study of the disease, with particular reference to the locally observed relationship of outbreaks with fire injury to the trees.

LACHMUND (H. G.). **Method of determining age of blister rust infection on Western White Pine.**—*Journ. Agric. Res.*, xlvi, 8, pp. 675–693, 1 fig., 1933.

In this paper the author suggests a method for determining the age of different infections of the western white pine (*Pinus monticola*) with blister rust (*Cronartium ribicola*) [*R.A.M.*, xii, p. 341]. The rust infests the bark of the host through the needles, and in the Pacific Northwest most of the needles of any one year's formation are shed at the end of the fourth season, although some needles may persist for five and a few for as long as eight seasons. While, therefore, infection of the bark may conceivably occur on internodes of any age up to eight years, it is obvious that by far the largest number of infections take place on internodes not over four years old. There was evidence that in the region investigated conditions favourable for heavy needle infection are generally

limited to a short period in any one season, and occur, on the average, about every third season. Observations showed that while the incubation period of the rust following needle infection varies in individual cases, the first discoloration or visible swelling of the bark that marks the incipient canker appears only under exceptional conditions in the first season following that of infection: such incipient cankers appear chiefly in the second season, to a lesser degree in the third season, and to a negligible extent, if at all, in subsequent seasons. The distribution of cankers resulting from an infection wave is characteristic; of 5,879 cankers from distinct infection waves of five different years in 14 different localities less than 10 per cent. occurred on growth of the season of infection, over 53 per cent. on that of the following season, over 31 per cent. on growth one year older, about 5 per cent. on fourth year's growth, while the percentages on still older growth were practically negligible. Most of the cankers in each wave are approximately the same age and result from the same season's infection.

A comparison with this typical distribution pattern, of comprehensive records, made from an infection area, of cankers classified according to stage of development and the year's growth affected, will generally permit an accurate determination of the main infection years and provide a reliable guide to the progress of the rust in that area.

NEFF (P.). **Shall we protect Western White Pine from blister rust?**—*Journ. of Forestry*, xxxi, 3, pp. 286-295, 6 graphs, 1 diag., 1933.

On the basis of average selling prices during the past ten years the writer concludes that a stumpage return of \$200 to \$300 per acre may reasonably be expected from the good western white pine (*Pinus monticola*) stands of Idaho. The fall in the price of *P. monticola* (16 per cent. of the average price for 1928-30) was less than that for *P. ponderosa* (25 per cent.) and mixed species (35 per cent.) and the author considers that a systematic campaign against blister rust [*Cronartium ribicola*: see preceding abstract] would be fully justified in the State.

LANGNER (W.). **Ueber die Schüttekrankheit der Kiefernadeln (*Pinus silvestris* und *Pinus strobus*).** [On the leaf fall disease of Pine needles (*Pinus silvestris* and *Pinus strobus*).]—*Phytopath. Zeitschr.*, v, p. 6, pp. 625-640, 3 figs., 4 graphs, 1933.

A full account is given of the writer's observations during 1931-2 at the Dresden Technical College, Tharandt, on the infection of pine (*Pinus sylvestris* and *P. strobus*) needles by *Lophodermium pinastri* and *Hypoderma brachysporum* [*H. desmazierii*: *R.A.M.*, ix, p. 227; xii, p. 254, *et passim*].

The mycelia arising from monospore cultures of *L. pinastri* on malt agar differed so widely in colour, ranging from pure white to brownish, and in reciprocal attraction or aversion, as to suggest the occurrence of heterothallism. On sterilized dead needles of *P. sylvestris* the leaf fall fungus produced pyrenidia but no

apothecia; on sterilized living needles it failed to grow. *L. pinastri* was isolated in a number of cases from the yellow, brown, and purple lesions on one-year-old needles preceding the actual leaf fall, as well as from the typical 'golden' spots on older needles, for which it is evidently responsible. *Dematium* [*Pullularia*] *pullulans* [ibid., x, p. 514; xi, p. 30] was also isolated with fair regularity from the diseased needles, but its part in the causation of the spotting is not clear. The mycelium of *L. pinastri* proved extremely resistant to high temperatures, withstanding ten minutes' exposure to 95° C. The fungus also resisted the complete desiccation of the branches for a short period, but failed to survive three years' preservation under dry conditions.

Pine needles infected by *L. pinastri* were found to give off more water than healthy ones, so that their fall cannot be attributed to a disorganization of the water balance following a dry spell. On the contrary, the desiccation of the branches associated with leaf fall is a direct consequence of infection.

The mycelium of *H. desmazierii* formed pycnidia and apothecia on sterilized dead needles, but failed to grow in the laboratory on living ones.

YAMAMOTO (W.) & ITO (T.). **Studies on the white pocket rot or 'renkon-kusare' of *Chamaecyparis formosensis* Mats.**—*Trans. Nat. Hist. Soc. Formosa*, xxii, pp. 433-442, 1932; xxiii, pp. 44-54, 1 pl., 1933. [Japanese, with English summary.]

Chamaecyparis formosensis, an important tree in the virgin forests of Formosa, is stated to suffer from a white pocket rot of the heartwood caused by *Stereum sulcatum*, known as an agent of a similar disease of conifers in North America. The fungus forms elongated lesions on the living trunk and twigs, filled with a white, fibrous mass of decomposed tissue; at an advanced stage the fibrous masses disappear, leaving hollows. Both the lignin and the middle lamella of the cell wall are dissolved.

Among the best media for the growth of *S. sulcatum* are onion, oatmeal, and 'koji' extract agar. No development occurred on substrata to which 0.2 to 0.1 per cent. tannic acid was added, and very scanty growth with an admixture of 0.05 per cent. The optimum temperature for the growth of the fungus on onion agar was found to lie between 22° and 25° C., with a maximum at 31° to 34°, development being more profuse at 16° than at 31°.

AGGARWAL (K. L.). ***Fomes annosus* on Deodar.**—*Indian Forester*, lix, 4, pp. 239-242, 1933.

Fomes annosus is stated to be widespread on the deodar [*Cedrus libani* var. *deodara*] plantations of the Seraj Forest Division, where climatic conditions are not altogether suitable for this tree. The affected poles assume a sickly aspect, the crowns becoming attenuated and the needles turning pale, while resin is exuded from the stem. The roots are rotten, spongy, and covered with the white mycelium of the fungus. *F. annosus* is steadily spreading from old to new regeneration areas, and attempts have been made to check its development by means of deep isolation trenches.

This method, however, has been only partially successful and is in any case too costly (over Rs. 25 [£1 17s. 6d.] per acre during the period from 1927-31) for general use. With advancing age the trees appear to manifest some degree of resistance to the fungus, so that excessive damage from this source is not anticipated, especially in healthy sites and with an admixture of spruce.

NISIKADO (Y.) & YAMAUTI (K.). **Contribution to the knowledge of the sap stains of wood in Japan. I. Studies on *Ceratomyces ips* Rumbold, the cause of a blue stain of Pine trees in western Japan.**—*Ber. Ohara Inst. Landw. Forsch.*, v, 3-4, pp. 501-538, 12 pl., 1933.

A comprehensive and fully tabulated account is given of the writers' investigations, conducted at the instance of the Local Forestry Bureau of Osaka, on the sap stains of pine (*Pinus densiflora* and *P. thunbergii*) which are stated to be prevalent and very injurious, causing the death even of standing trees, in the plantations of western Japan. Among the numerous species of *Ceratomyces* and *Graphium* associated with the diseased material, *C. ips* [*R.A.M.*, xi, p. 341] was constantly found in the blue-stained sapwood of living pine roots, and was readily obtained in pure culture on malt extract agar. In the districts near the coast of the 'Inland Sea' in Hyōgo and Osaka Prefectures *C. ips* was found in connexion with infestation by bark beetles (*Ips* spp.).

The dark to blackish-brown, pluriseptate hyphae, 4 to 8 μ in width, occur in the medullary rays, resin ducts, and tracheids, into which they penetrate through the bordered pits. The discoloration is at first wedge-shaped and gradually extends uniformly over the surface. The obovate to elliptical or cylindrical conidia are borne in heads on brown conidiophores measuring 90 to 100 by 5 to 8 μ at maturity. The conidia fall into two groups as regards length, viz., a small type 3 to 9 μ long (mean $4.82 \pm 0.045 \mu$) and a large type 7 to 18 μ (mean $11.42 \pm 0.097 \mu$), the width of both groups being fairly uniform (1.5 to 4 μ , mean $2.58 \pm 0.015 \mu$). Secondary conidia, 3 to 6 by 1.5 to 3 μ , are formed on the tips of the germ-tubes or on the conidia themselves. The black, flask-shaped perithecia are without setae and measure 120 to 240 μ (mean $177.8 \pm 2.69 \mu$) in height by 110 to 250 μ (mean $179.6 \pm 3.10 \mu$) in diameter, with a beak (devoid of the fimbriate appendages typical of the genus) 80 to 400 μ long (mean $215.0 \pm 7.60 \mu$) by 30 to 50 μ , or up to 1,540 μ long in culture. The rapidly diffuent asci are apparently elliptical, ovoid, or irregular, with eight mucilaginous, hyaline, cylindrical ascospores with truncated ends, giving a rectangular aspect under the microscope, 3 to 6 by 1.5 to 3 μ ; on germinating, the ascospores swell and the ends become round, the characteristic *Cephalosporium*-like conidia developing within two days in malt extract solution.

On standard media, the colour of the colonies ranges from hyaline or milk-white to black. The minimum, optimum, and maximum temperatures for mycelial growth were found to be 6° to 8°, 27° to 29°, and 35° C., respectively; conidial formation takes place throughout the range of development, being most profuse at

27° to 31°. The optimum temperature for perithecial production on sterilized pine or oak blocks appears to be from 27° to 29°. The conidia succumbed to ten minutes' exposure to a temperature of about 52°. Neither mycelial growth nor conidial formation occurs in the absence of free oxygen.

FINDLAY (W. P. K.). **The germination of the spores of *Merulius lacrymans* (Wulf.) Fr.**—*Trans. Brit. Mycol. Soc.*, xvii, 4, pp. 334-335, 1 fig., 1933.

The author obtained germination of fresh spores of *Merulius lacrymans* after six days at about 20° C. on 8 per cent. malt agar plus 1 per cent. malic acid or 1 per cent. phosphoric acid; the germination was delayed in many spores, but at the end of the experiment, when overgrowth of the mycelium prevented further observations, approximately a quarter of the spores had germinated. Germination was also observed on a medium made up of an old autoclaved culture of *Coniophora cerebella* mixed with fresh malt agar, the reaction of which was distinctly acid, whilst a few spores germinated on untreated Sitka spruce [*Picea sitchensis*] and beech wood. The difficulties experienced by some previous workers in germinating spores of *M. lacrymans* are believed to have been due to the fact that they used spores that were no longer fresh.

SANBORN (J. R.). **Production of parchment-like membranes from cultures of slime-forming microorganisms.**—*Indus. & Engin. Chem.*, xxv, 3, p. 288, 1933.

The species of *Oidium* and *Monilia* isolated from pulp and paper mill slimes in the United States [*R.A.M.*, xii, p. 545] were found to develop profusely in media with a high carbohydrate content, producing doughy and somewhat rubbery growths. Suitable substrata are potato decoction or ground-wood extract, with the addition of glycerol, dextrin, or glucose. Satisfactory transparent parchment-like membranes have been produced from these slime growths by comminution of the material in water, deposition of slime particles on the sheet-forming substratum by means of an aspirator, lubrication of the resultant membrane by a glycerol and mineral oil treatment, and desiccation in a steam hot-plate sheet drier.

SANBORN (J. R.). **The formation of semi-transparent membranes from cultures of slime-producing micro-organisms.**—*Science*, N.S., lxxvii, 1994, p. 290, 1933.

Some further details are given of the methods developed at the laboratory of the International Paper Company, Glens Falls, New York, for the production of transparent parchment-like sheets from cultures of the slime-forming organisms (*Monilia* and *Oidium* spp.) occurring in pulp and paper mills [see preceding abstract.]

MOTTE (M. H.). **La hernie du Chou.** [The finger-and-toe disease of Cabbage.]—*Journ. d'Agric. Prat.*, N.S., xevii, 9 pp. 177-178, 1933.

The writer's observations on finger-and-toe disease of crucifers

(*Plasmodiophora brassicae*) in Denmark are summarized. Black mustard [*Brassica nigra*] is practically immune from infection while charlock [*B. sinapis*] is severely damaged, its roots being covered with swellings. Among the cultivated crucifers, red cabbage is the most resistant, followed by the smooth-leaved white and Savoy, while cauliflower, Brussels sprouts, and the non-heading types of cabbage are more susceptible. Table varieties of turnip are more susceptible to infection by *P. brassicae* than those used for fodder. The latter frequently show aerial lesions, indicating that infection does not occur exclusively through the root hairs. The most resistant turnip varieties are the Funen Bortefeller and Norwegian May. Swedes suffer more severely than turnips from the attacks of *P. brassicae*, which rapidly involves the whole root. Wallflowers [*Cheiranthus cheiri*] are moderately susceptible.

Finger-and-toe is most prevalent in light soils and in dry seasons, and in the early stages of infection the plants are temporarily stimulated to abnormally rapid and luxuriant growth. Some indication of biologic specialization in *P. brassicae* was given [cf. *R.A.M.*, xi, pp. 16, 277]. The form from charlock appears to be specially well adapted to growth on the turnip.

Five years' experiments in the control of *P. brassicae* by the application of lime and potash gave inconclusive results. Practically no attempt is made to combat the disease on a large scale in Denmark, but market-gardeners appear to keep it within bounds by complete abstention from the use of organic manure. Septennial crop rotation is recommended in infected land.

WALKER (J. C.). **Yellows-resistant lines of Jersey Wakefield Cabbage.**—*Journ. Agric. Res.*, xlvi, 7, pp. 639-648, 2 figs., 1933.

Continued studies of the inheritance of resistance to cabbage yellows (*Fusarium conglutinans*) in the Jersey Wakefield variety [*R.A.M.*, ix, p. 694] confirmed the existence of a single factor difference between plants highly resistant or highly susceptible to this disease. It was shown that when a commercial line of this variety was planted on infected soil, it was possible to isolate homozygous resistant pure lines from the resistant survivors, and that such lines continued to be completely resistant in succeeding generations. The work also demonstrated the possibility of combining resistance with the more important type characters of this variety without having recourse to repeated back crossings with the susceptible stock, although this procedure may have to be adopted when it becomes necessary to accumulate in the resistant lines the genes controlling the desirable market characters.

NEILL (J. C.). **Production of disease-free Swede seed. Preliminary trials under the small-farm plan.**—*New Zealand Journ. of Agric.*, xlvi, 4, pp. 207-210, 1933.

The author states that the two main diseases of swedes in New Zealand, responsible for the steady decline in that Dominion of the area annually sown to this crop, are dry rot [*Phoma lingam*: *R.A.M.*, xii, pp. 134, 481] and finger-and-toe [*Plasmodiophora*

brassicae: *ibid.*, xii, p. 412]. Investigations have shown that dry rot, a seed-borne disease, may be economically controlled by sowing seed from healthy plants on land which has not carried a diseased crop for the two previous years and which is removed from the neighbourhood of swedes or turnips grown from infected seed, while finger-and-toe can be practically controlled by the use of certain resistant varieties or strains of swedes, if certain precautions are taken in sowing.

On the basis of these results a plan is outlined for the production of main crop swede seed from plants grown from mother seed sown during the preceding autumn. Since experiments indicated that the best results are obtained by raising the seedlings on special nursery beds and transplanting them to the final position for seeding, it is projected in preliminary trials to grow the seedling plants at the Plant Research Station from dry-rot-free mother seed selected and bred at the Station, and to distribute them to three growers for planting out in June and July, so that the seed crop may be harvested the following January or February. Should this initial experiment be successful it is believed possible to create a new industry under expert official supervision, which is likely not only to save New Zealand the £60,000 now spent annually abroad for swede seed, but also to become a profitable source of export, besides reducing the enormous financial losses that are caused every year by the seed-borne diseases of the crop.

WALKER (J. C.) & SNYDER (W. C.). **Pea wilt and root rots.**—*Wisconsin Agric. Exper. Stat. Bull.* 424, 16-pp., 2 figs., 2 graphs, 1933.

Popular notes are given on the following diseases affecting peas in Wisconsin: wilt (*Fusarium orthoceras* var. *pisi*), 'near wilt' [*R.A.M.*, xii, p. 548], and the root rots caused by *Aphanomyces euteiches*, *F. martii* var. *pisi*, *Rhizoctonia* (*Corticium vagum*) [*C. solani*], *Ascochyta pinodella*, and *Mycosphaerella pinodes* [*ibid.*, xii, p. 483]. Wilt has been found to yield only to the cultivation of resistant varieties [a list of which is given: *ibid.*, xii, p. 412], while the root rots require special cultural measures, including heavy fertilizing, crop rotation, thorough drainage, and the use of clean seed from the dry regions of the mountain States.

MEYER-HERMANN (K.). **Neue Wege zur Bekämpfung der Herz- und Trockenfäule der Rüben.** [New methods for the control of heart and dry rot of Beets].—*Deutsche Landw. Presse*, lx, 16, p. 194; 17, p. 205, 4 figs., 1933.

Excellent results have been obtained in the Cassel district of Germany against heart and dry rot of beets (Eckendorf fodder) by the application to the soil of borax at the rate of 20 kg. per hect., as recommended by Brandenburg in Holland [*R.A.M.*, xii, p. 2]. In one test covering an area of 12.5 ares the increased yield due to the treatment was estimated at 282 doppelzentner of beets per hect., the approximate cost being M. 8 per hect. Moreover, the sugar content of the treated plants was considerably higher than that of the controls.

MATZULEVITCH (B. P.). Болезни Лука. [Onion diseases.]—*Всесоюз. Госуд. Объединение по борьбе с вредителями и болезнями в Сельском и Лесном Хоз.* [Pan-Soviet State Assoc. Control of Pests and Diseases in Agric. and Silviculture], Leningrad, Publ. 10, 24 pp., 1932. [Received June, 1933.]

In the first part of this pamphlet the author gives very brief descriptions of the more important diseases of onion prevalent in Russia, namely, downy mildew (*Peronospora schleideni*) [R.A.M., xii, p. 484]; leaf mould (*Macrosporium parasiticum*) [ibid., x, p. 499]; smut (*Urocystis cepulae*) [see next abstract]; white rot (*Sclerotium cepivorum*) [ibid., xi, p. 219]; pink root rot caused by *Fusarium cepae* [ibid., x, p. 795]; grey mould (*Botrytis allii*) [ibid., ix, p. 82]; and a disease, chiefly of seedlings, characterized by an excessive brittleness of the leaves and roots, with the formation on the latter of swellings. In this disease, the cause of which is believed to be an undetermined species of *Fusarium*, most of the plants attacked fail to develop and rot.

The remainder of the pamphlet consists of instructions to local phytopathologists on the methods to be employed in making reports to central authorities, and of recommendations for control.

EVANS (R. I.). Cytological studies on the parasitic relationship of *Urocystis cepulae* to the Onion.—*Amer. Journ. of Botany*, xx, 4, pp. 255–268, 2 pl., 1933.

In a study of penetration of the fungus into Southport Red Globe onion seedlings experimentally infected by *Urocystis cepulae* [R.A.M., v, p. 646; *et passim*] in Wisconsin, no indications were found of appressoria, or of any sort of anchorage of the fungus to the host epidermis. The wall beneath the cuticle is apparently dissolved away by a secretion produced by the infection hypha and judging from the bulging of the innermost layers of the wall inwards a certain amount of pressure is exerted by the hyphal tip. Neither cytological nor morphological changes were observed in the invaded epidermal or subepidermal host cells. True haustoria were not detected, but these organs were simulated by the dichotomous branches arising from the epidermal mycelium and penetrating the subepidermal cells.

As the onion plant approaches a condition of immunity with the maturing of the cotyledonary tissues, the lesions contracted during this transitional period become progressively less conspicuous, though there is no apparent decrease in their numbers. At the same time the hyphae that have succeeded in penetrating the epidermal cells of the host show increasing signs of distortion, and the attainment of absolute immunity by the host coincides with the complete degeneration of the fungus. Irregular structures which the author terms 'subcuticular vesicles' were constantly observed in the outer epidermal wall of onions on the verge of immunity from infection, and are thought probably to be composed of fungus mycelium which has digested a place for itself in the cell wall, representing an attempt on the part of the host to inhibit the passage of the invading fungus into the epidermal cell.

McHARGUE (J. S.) & CALFEE (R. K.). **Further evidence that boron is essential for the growth of Lettuce.**—*Plant Physiol.*, viii, 2, pp. 305–313, 6 figs., 2 graphs, 1933.

In a previous report (*Plant Physiol.*, vii, p. 161, 1932) the writers showed that the exclusion of boron from the mineral nutrient solution in which lettuce of several varieties was grown resulted in a severe deficiency disease, characterized by malformation of the more rapidly growing leaves, spotting and burning of the tips, and death of the growing point. A similar condition of lettuce was described by Stone and Smith in 1897 as 'top burn' and attributed to unfavourable surroundings, but Le Clerg was unable to establish a correlation between temperature and tipburn [*R.A.M.*, xii, p. 197].

The writers' experiments at the Kentucky Agricultural Experiment Station showed that the burning of lettuce leaves is preventable by the addition to the nutrient medium of boric acid [cf. *ibid.*, xii, p. 2], boro-silicate (powdered Pyrex glass), or the borates of potassium, sodium, calcium, manganese, copper, or zinc at the rate of 0.4 to 0.9 p.p.m. boron; at higher concentrations (1.0 to 2.5 p.p.m.) the compounds were definitely injurious to the plants, and above the latter strength fatal.

The boron content of normal lettuce plants was found to range between 25 and 50 p.p.m. of the moisture-free tissues, some degree of deficiency being shown by those containing less than 20 p.p.m., while signs of toxicity were apparent where the boron content exceeded 50 p.p.m. The concentration of boric acid in the leaves of the test plants was found to depend on that of soluble boron in the solution, indicating a correlation between the latter and the rate of absorption by the plant. Boro-silicate proved to be the most satisfactory compound for incorporation in sand cultures.

BUDDIN (W.) & WARE (W. M.). **Clitocybe dealbata as an invader of Mushroom beds.**—*Gard. Chron.*, xciii, 2415, pp. 246–248, 4 figs. (1 on p. 249), 1933.

Attention is drawn to a severe outbreak of *Clitocybe dealbata* on indoor and outdoor mushroom [*Psalliota campestris*] beds near Petersfield, Hampshire, in February, 1933 [*R.A.M.*, xi, p. 493]. The parasite was apparently introduced with a truckload of dung in September, 1930, since when it had steadily spread from house to house and to the adjacent outdoor beds, until finally all the floors, soil, and compost were found to be permeated by the coarse, white mycelium and clumps of white sporophores. The systematic position and morphology of *C. dealbata* are briefly discussed, with special reference to its separation from *C. candicans*, which is never fasciculate. Notes are given on previous outbreaks in England and France and control measures are recommended based on the replacement of infected beds by fresh material, and on general plant sanitation.

UPPAL (B. N.). **India: diseases in the Bombay Presidency.**—*Internat. Bull. of Plant Protect.*, vii, 5, pp. 103–104, 1933.

The following are among the plant diseases newly recorded for the first time in the Bombay Presidency: *Peronospora trigonellae*

on *Trigonella foenum-graecum* (first report for India); *Sclerotium rolfsii* on *Cannabis sativa*; *Cercospora rosicola* on rose [*R.A.M.*, ix, p. 613]; and mosaic on *Helianthus annuus* and *Momordica charantia*.

ADAMS (J. F.). **Report of the Plant Pathologist for 1932.**—*Quart. Bull. State Board of Agric., Delaware*, xxiii, 1, pp. 3–16, 1 graph, 1933.

Continuing his annual reports on the health of crops in Delaware [*R.A.M.*, xi, p. 560; cf. also xii, p. 267], the author states that in 1932 dipping sweet potato sprouts in semesan bel [*ibid.*, x, p. 363] increased the yield by 27 bushels, and gave freedom from scurf [*Monilochaetes infuscans*] (as against 14 per cent. infection in the control plants) and only a trace of black rot [*Ceratostomella fimbriata*]. Dipping the sprouts in a dilution of four ounces improved semesan bel in 2 gall. water, on the other hand, while giving complete control of the two diseases, reduced the yield by 28 bushels.

Observations on the relationship between the primary infection of apple trees with scab (*Venturia inaequalis*) and the efficacy of sprays indicated that the possibility of obtaining practical control of the disease is favoured when the major maximum discharge of the ascospores occurs before blossoming, this opinion being based on the fact that as tree growth advances, the total leaf area exposed to infection progressively increases, thus lowering the relative potential efficacy of the sprays.

Among the other crop diseases recorded, mention may be made of the discovery of leaf spot (*Cercospora duizu*) [*ibid.*, xi, p. 87] on soy-beans in the Seaford section, this being the first record of the fungus for Delaware.

Plant pathology. [*ex* Experiment Station Summary Report of Progress 1932.].—*Maine Agric. Exper. Stat. Bull.* 363, pp. 274–294, 5 figs., 1932. [Received July, 1933.]

In the part of this report dealing with degeneration diseases of Green Mountain potatoes it is stated that yield tests made during the period from 1918 to 1932 in north-western Maine showed that with 100 per cent. mild mosaic the yield was reduced by 10 to 33 per cent., with an average of 21 per cent. In central Maine it was found that a distance of half a mile from the nearest virus-diseased potatoes was not sufficient to prevent invasion of the crop by leaf-roll carriers in 1931. Further experiments indicated that the aphid *Macrosiphum solanifolii* [*M. gei*] cannot transmit latent mosaic, which is present in a masked condition in most of the important American commercial varieties of potato, to healthy Green Mountain seedlings, though various other viruses that were present mixed with the latent virus in the diseased plants were readily transmitted by this insect.

Botrytis cinerea was isolated from a rot of stored potatoes, and the rot was experimentally reproduced under certain conditions by various cultures of this fungus, including some that were isolated from potato leaves and stems during an epidemic of *B. cinerea* in

the field. In Aroostook County late blight [*Phytophthora infestans*] was very severe and caused losses estimated at 10 per cent. of the crop; this was partly due to the financial depression which caused many growers to make fewer spray applications than normal. The potato spray service, started in 1931, has greatly increased in popularity in the county, 311 farmers, with 2,605 acres of potatoes, co-operating in it in 1932. Under these severe late blight conditions 10-10-100 Bordeaux mixture gave perfect control of the disease, and the yield obtained from plots treated with it was significantly superior to that from plots treated with home-mixed copper-lime dust (25 lbs. monohydrated copper sulphate to 75 lbs. hydrated lime); 5-5-100 Bordeaux mixture applied with a power machine also gave good control but was less efficient than the full strength towards the latter part of the season. Continued tests of the potato variety known locally as Rust Proof showed that under the extremely severe conditions in 1932 this variety was very resistant both to foliage blight and tuber rot due to *P. infestans*. It yielded in unsprayed plots 117 barrels per acre with no decay, while comparable plots of Green Mountains yielded 45 barrels per acre with 48 per cent. decay. Potatoes in Maine were also severely attacked in 1932 by *Rhizoctonia* [*Corticium solani*], which caused considerable losses in the form of uneven stands. Preliminary laboratory and field experiments indicated that the addition of 0.25 per cent. potassium iodide to a 1 in 1,200 mercuric chloride solution considerably increased the fungicidal efficacy of the latter when used as a tuber dip for the control of *C. solani*.

In spraying tests on McIntosh apples the addition in 1932 of 0.75 lbs. iron sulphate to 50 gallons of dry lime-sulphur spray in three applications gave a significant decrease in leaf scorch and a significant increase in yield; it also resulted in a better control of scab [*Venturia inaequalis*] and in a reduction of fruit russetting as compared with lime-sulphur alone.

Inoculations of young fir (*Abies balsamea*) needles with teleutospores of the blueberry (*Vaccinium corymbosum* and *V. pennsylvanicum*) witches' broom fungus (*Calyptosporu columnaris*) [*R.A.M.*, x, p. 532] resulted in the formation on them of aecidial pustules from the twelfth day onward, with 100 per cent. infection in 16 days. On blueberry plants sprayed in April with aecidiospores from the fir, witches' brooms began to appear in three months' time but discontinued growth until the onset of cool weather in October. It is believed that the incubation period of the witches' broom stage in blueberry under natural conditions lasts approximately one year.

Plant diseases. [*Ex Facts for farmers. Annual Report of the Director Wisconsin Agricultural Experiment Station 1931-1932.*—*Wisconsin Agric. Exper. Stat. Bull.* 425, pp. 96-112, 5 figs., 1933.

A number of the items in this report have already been noticed from other sources, but the following may be mentioned. Field experiments by J. C. Walker and L. M. Blank on the onion bulb rotting caused by *Fusarium* spp. indicated that two out of the

five cultures used as inocula were highly pathogenic to the red, yellow, and white varieties, viz., *F. zonatum* form 1 from Wisconsin and Illinois [*R.A.M.*, xi, p. 421] and *F. cepae* [*ibid.*, xii, p. 135] from Wisconsin and Colorado. Organic manure increased this disease as compared with commercial fertilizers.

W. H. Pierce and J. C. Walker found that the Robust or yellow strain of bean [*Phaseolus vulgaris*] mosaic [*ibid.*, xi, p. 561 and next abstract] is transmissible by the pea and potato aphids [*Macrosiphum pisi* and *M. gei*] but not seed-borne. It is capable of infecting soy-beans, broad beans [*Vicia faba*], and tepary beans [*P. acutifolius* var. *latifolius*], crimson clover [*Trifolium incarnatum*], and sweet clover [*Melilotus alba*]. M. C. Parker's and R. A. Brink's genetical studies on common bean mosaic have shown that in crosses between highly resistant and very susceptible types, e.g., Robust and Stringless Green Refugee, more than half (56 per cent.) the progeny in the F_2 generation are resistant when Robust is the female parent, while nearly all (98.7 per cent.) are susceptible in the reciprocal cross. Evidently, therefore, the inheritance of resistance is non-Mendelian, and the fact that it is transmitted mainly through the female line suggests that the governing factor is carried in the cytoplasm. Breeding experiments are in progress to test the validity of this hypothesis.

Leaf spot of cherries [*Coccomyces hiemalis*], a very destructive disease in the Door peninsula, was effectively combated in G. W. Keitt's and E. C. Blodgett's tests on the Montmorency variety by three applications of Bordeaux mixture or 1 in 40 lime-sulphur (1) when three-quarters of the petals had fallen; (2) a fortnight later; and (3) after harvest [*ibid.*, x, p. 741 *et passim*]. Four treatments with colloidal sulphur ($1\frac{1}{2}$ -50) or flotation sulphur (5-50) [*ibid.*, xii, p. 577] failed to give comparable results. The two last-named preparations were also ineffectual against apple scab [*Venturia inaequalis*].

Good control of oat smut [*Ustilago avenae*] was obtained by J. G. Dickson, B. D. Leith, and W. H. Tharp in tests with formaldehyde dusts containing 7 per cent. or more of formaldehyde [*ibid.*, vii, p. 159; x, p. 373; xi, p. 634]. The yields in the plots so treated were equal to those secured by the application of the more expensive volatile mercury dusts.

J. G. Dickson found that the smooth-awned barley Pedigree 38 maintained its resistance to stripe disease (*Helminthosporium gramineum*) [*ibid.*, xi, p. 560], contracting less than 0.5 per cent. infection in 18 fields compared with 2.9 and 12.7 per cent. in 14 and 16 fields of Oderbrucker Pedigree 6 and Velvet Minnesota, respectively. Loose smut of barley [*U. nuda*] has proved amenable to control by a modified hot water treatment consisting in four hours' immersion at 90° F., followed by 13 minutes at 126° to 128° with subsequent rapid cooling and drying. Barley scab [*Gibberella saubinetii*] is reported to have caused heavy losses in Illinois and Iowa, but in Wisconsin it was largely prevented by cutting the stalks after harvest for silage or fodder and thorough ploughing under all remaining refuse. Feeding experiments indicated that hogs should not be given barley containing over 10 per cent. scabbed kernels [*ibid.*, x, p. 651].

Plant pathology. [*Ex* Work and progress of the Agricultural Experiment Station for the year ending December 31, 1932.]
—*Idaho Agric. Exper. Stat. Bull.* 197, pp. 45-48, 1933.

Seed potato virus diseases have been reduced to a minimum in Idaho by the practices of tuber indexing and tuber uniting [*R.A.M.*, xii, p. 50].

Favourable results have again been obtained with the mosaic-resistant U.I. No. 1 selection of the Great Northern bean [*Phaseolus vulgaris*] variety [*ibid.*, ix, p. 229; xii, p. 414].

For three years seven lucerne varieties have been grown in three widely separated localities where wilt [*Aplanobacter insidiosum*] occurs in a severe form. During 1932 marked differences were apparent in the yielding capacity and reaction to wilt of these varieties, common lucerne being the most satisfactory in both respects, followed by Cossack and Ladak, while Grimm and Hardigan were unproductive and very susceptible [*ibid.*, xi, p. 787].

The powdery mildew of clover [*Erysiphe polygoni*] has been shown to be transmissible from alsike [*Trifolium hybridum*] to red clover [*T. pratense*] and vice versa [*ibid.*, xi, p. 246; xii, p. 78]. The perfect stage of the fungus, however, is produced only on the former host.

Heavy damage has been caused for a number of years in the mountainous region of Sandpoint by snow scald of wheat and barley, due to a fungus believed to be identical with *Typhula graminum*, a culture of which has been obtained from Japan [*ibid.*, ix, p. 709] for comparison.

Serving California agriculture. Report of the California Agricultural Experiment Station July 1, 1931, to June 30, 1932.
—106 pp., 8 figs., 6 diags., 1933.

The following items of phytopathological interest, in addition to those already noticed from other sources, occur in this report. 'Black end' of pears [*R.A.M.*, xii, p. 574] resulted from grafting on Japanese stocks (*Pyrus serotina*), for which French pear stocks or quince stocks should be substituted.

An extensive die-back and leaf scorch of prunes in the Sacramento Valley is attributed to potassium deficiency coupled with excessively heavy bearing.

Of 38 varieties and strains of lucerne tested for resistance to wilt [*Aplanobacter insidiosum*: see preceding abstract], Ladak and a number of Turkestan strains have given encouraging results.

Sulphur having proved injurious to cantaloupe vines in spraying tests against powdery mildew [*Erysiphe cichoracearum*: *R.A.M.*, xi, p. 28], a selected strain of Persian melon resistant to this type of damage has been distributed to growers for trial in Imperial and Riverside counties.

Tomato, pepper [*Capsicum annuum*], and eggplant were found to be susceptible to artificial inoculation with potato calico [*ibid.*, xi, p. 320], the transmissibility of which by at least one insect has been established.

In preliminary tests chlorine and nitrogen trichloride proved

effective against the moulds contaminating disinfecting boxes, belts, and other equipment in citrus packing houses.

VERONA (O.). **Une observation sur l'action pathogène du *Bacterium tumefaciens* Smith et Townsend.** [An observation on the pathogenic action of *Bacterium tumefaciens* Smith et Townsend.]—*Boll. Sez. Ital. della Soc. Internaz. Microbiol.*, v, 5, pp. 139-140, 1933.

When *Bacterium tumefaciens* was added to pots containing *Vicia faba* plants growing in Knop's solution the secondary roots and tap-roots after a few days developed a brown discoloration which gradually spread to the collar, stem, branches, and the main and secondary veins of the leaves, the bacterium slowly becoming diffused through the plants, obstructing the vessels and causing necrosis of the tissues at certain points where it became localized. As *Bact. tumefaciens* is not infrequently present in the soil, some importance is attached to this observation of its ability to produce vascular necrosis.

BORGHARDT (A. I.). **Основы построения системы мероприятий по ликвидации головни в зерновом производстве СССР.** [Basic principles underlying the measures proposed for the total elimination of smuts from cereal crops in USSR.]—*Bull. Plant Protection*, Leningrad, Ser. II (*Phytopath.*), 1932, No. 2, 79 pp., 18 figs., 1932. [Received June, 1933.]

In an editorial preface this paper (written in 1930) is stated to have served as a basis for the measures which were adopted by the Pan-Soviet Smuts Conference in 1931 for the effective control in Russia of cereal smuts, and more particularly of wheat bunt (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetens*]. It opens with a discussion of the causes which, in the author's opinion, underlie the failure of the control measures hitherto employed both in Russia and abroad (chiefly lack of co-ordination and standardization of the methods) and which, he believes, may be easily obviated in a country where co-operative action on the Soviet lines is enforced. Stress is especially laid on the wastefulness of the old methods owing to the haphazard application of the treatments or disinfectants, without regard to the degree of contamination of the seed-grain, but mainly to the fact that hitherto each grower has had to treat, to obtain full control, the whole of his seed material, whereas this would be unnecessary if grain from a clean crop could be secured. This may be done by separating the production of cereal seed-grain from the commercial growing of the crops, entrusting it to special bodies whose business it would be to supply the growers within their area with clean seed. According to his calculations only 15 per cent. of the total seed requirements of the whole country need be disinfected every year.

A detailed discussion, based on many years of experiments and observations in Russia, is given of the various methods of seed treatment [all well known] for the control of the chief cereal smuts which are divided into three groups, namely, (a) wheat bunt (*Tilletia tritici*) [*T. caries*], rye bunt (*T. secalis*) and stripe smut (*Urocystis occulta*), *Panicum miliaceum* smut (*Ustilago panici-*

miliacei), *Setaria italica* smuts (*U. crameri* and *U. neglecta*) [R.A.M., v, p. 174], sorghum smuts (*Sphacelotheca cruenta*, *S. sorghi*, *Ustilago bulgarica* [ibid., viii, p. 339], and *U. sorghicola* Speg.), and sorghum and maize smut (*Sorosporium reilianum*) [ibid., xii, p. 563], all of which are amenable to control by liquid, semi-liquid, or dust seed treatment; (b) loose wheat smut (*U. tritici*), covered and loose barley smuts (*U. hordei* and *U. nuda*), and covered and loose oat smuts (*U. kolleri* and *U. avenae*), amenable to treatment of the seed-grain by heat; and (c) maize smut (*U. zaeae*), which is not controllable by seed treatment. Particularly effective in the control of the first group of smuts where contamination of the grain is not excessive, is stated to be the dust preparation AB [ibid., xii, p. 559], owing to the fineness of its structure and to its adhesiveness; it consists of 36 per cent. copper carbonate ($2\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2$), 56 per cent. gypsum, and 8 per cent. Paris chalk. Its commercial preparation is described in detail in an appendix. The dust is stated to have a neutral reaction, preventing it from corroding the metallic parts of seed drills, and its light specific gravity renders it much easier to apply than the ordinary copper carbonate dusts; 1 kg. of this preparation is sufficient to treat 640 kg. of wheat, and its cost is much lower than that of the commercial copper carbonate. Good results were also obtained with chrompik [loc. cit.] which is stated to be a preparation of potassium bichromate, and calcium arsenate ($\text{Ca}_3\text{As}_2\text{O}_8$); the last-named substance is stated, however, to have a very depressing effect on the germination of wheat, and should not be used at doses higher than 1 gm. per kg. of seed-grain.

The paper also contains an illustrated description of several apparatus for liquid, semi-liquid, and dry treatment of the seed-grains, among which preference is given to the Russian machines 'Pobieda', a dusting apparatus with a capacity of 12 cwt. grain per hour, constructed by P. M. Davydoff; 'AB-1', a combined apparatus for liquid, semi-liquid, and dust treatments, constructed by the author, with a capacity of 15 cwt. per hour; and 'Niloff 2', a similar but larger apparatus constructed by the Scientific Research Laboratory for Poisons [Leningrad], with a capacity of 150 cwt. per hour. Mention is also made of two recent German apparatus constructed by Gebr. Röber and by Kalker Trieurfabrik for use with their Petkus [ibid., vii, p. 436] and Kraft grain-cleaning machines; and finally of a combined grain-cleaning and treating machine on wheels constructed by the Neuhaus-Eberswalde Works in Germany.

The paper terminates with a table in which the relative efficacy of 39 fungicides is shown by figures representing the averages for several years of the percentage infection in crops raised from treated and untreated seed, the smuts considered being *T. caries*, *U. hordei*, *U. kolleri*, *U. avenae*, and *U. panici-miliacei*.

GAINES (E. F.) & SMITH (W. K.). **Reaction of varieties and hybrids of Wheat to physiologic forms of bunt.**—*Journ. Amer. Soc. Agron.*, xxv, 4, pp. 273-284, 1 diag., 1 graph, 1933.

Eleven autumn-sown and 15 spring wheat varieties were used in the differentiation of five physiologic forms of *Tilletia tritici*

[*T. caries*] and at least two of *T. levis* [*T. foetens*] obtained from bunt collections in the Pacific Northwest [*R.A.M.*, xii, p. 204]. The reactions of 27 winter wheats, including the chief commercial varieties of the area in question, to single cultures and mixtures of these forms are described and tabulated.

Hohenheimer is highly resistant to physiologic forms T2 and L4 ($T = T. caries$ and $L = T. foetens$) to which White Odessa is quite susceptible, while both are moderately resistant to T11. The seed obtained from each F_2 plant of a cross between Hohenheimer and White Odessa was divided into three parts, one of which was inoculated with T2, another with L4, and the third with T11. The factor in Hohenheimer governing strong resistance to T2 was found to be responsible for a similar reaction to L4, and for the moderate resistance of this variety to T11. In the reaction of progenies to the last-named strain, well-marked transgressive segregation was apparent, some being much more resistant and others much more susceptible, than either parent. The moderate resistance of White Odessa to T11 was found to be determined by a single main factor different from that inducing resistance in Hohenheimer.

BRENTZEL (W. E.). **Physiologic specialization of *Tilletia tritici* on Emmer.**—*Phytopath.*, xxiii, 5, pp. 483-485, 2 figs., 1933.

Tilletia tritici [*T. caries*] is destructive on Yaroslav emmer (*Triticum dicoccum*) in North Dakota, where natural infection by *Tilletia levis* [*T. foetens*] on this wheat has not been observed by the writer, though artificial inoculations were successful. From a critical study of four collections of *T. caries* on emmer and 146 on durum wheat it appeared that the spores of the former were quite distinct from the latter, being uniform in size, almost spherical, and more regularly bearing well-developed reticulations. The smut balls developing on Ceres wheat from inoculations with each of the emmer forms were much elongated, whereas those from ten durum collections were rounded. The average percentage of smutted Ceres heads from the emmer inoculations was only 24, compared with 86 from the durums. In field tests the emmer smuts produced low percentages of infection on ten common wheats and relatively high ones on emmer, while with the durum collections the position was reversed. The four collections of emmer smut appear to belong to one physiologic form.

NILSSON (E.). **Paralleles Auftreten von *Tilletia*-Infektion und Speltoidcharakter bei *Triticum vulgare*.** [The correlation between *Tilletia* infection and speltoid character in *Triticum vulgare*.]—*Hereditas*, xviii, 1-2, pp. 262-268, 3 figs., 1933.

In 1930 the writer examined 20 Standard wheat ears infected by bunt (*Tilletia*) [*? caries*: *R.A.M.*, viii, p. 767] at Eslöv, Sweden. One of the ears contained a single healthy grain, which was sown in the autumn and produced a completely healthy plant. Immediately after the 1931 harvest the grains of this plant were heavily infected with *Tilletia* spores and sown in an experimental plot at a distance of 10 cm. apart. An inspection of the 34 plants

surviving the winter showed that six bore exclusively speltoid ears, three a mixture of normal and speltoid, one had normal, speltoid, and 'mosaic' (representing both types in a mosaic-like distribution), one normal and mosaic, and three speltoid and mosaic, the remainder being normal. Soon after tillering it was observed that all the speltoid and 'chimera' ears were severely attacked by bunt, from which those of the normal type remained free.

It is considered from these investigations, as well as from previous observations of a similar phenomenon, that a definite correlation exists between the speltoid character and infection by bunt, but further studies are necessary, and have already been initiated, to elucidate the connexion between cause and effect. In the meantime several possible theories are advanced. The mother plant of the series (that arising from the single healthy grain in a bunted ear) may have been an ordinary, homozygous, normal plant without complications; the speltoid character of some of the progeny would then have been directly due to the bunt attack, possibly involving the elimination of a *C* chromosome. Or the development of the speltoid character may have been the opening phase of a 'mass mutation', to which the bunt invasion was a sequel. Possibly, too, the mother plant may have been heterozygous for the speltoid character and have segregated into the above-mentioned types; or again, it may have been a chimera in which the speltoid components were entirely concealed ('crypto-chimera'). In this case also the fungus may either have caused the speltoid development or selected for preference the ears deviating from the normal type.

SCOTT (R. C.). **Rust in Wheat crops in South Australia, season 1932-33.**—*Journ. Dept. Agric. S. Australia*, xxxvi, 10, pp. 1144, 1146-1147, 1933.

The author states that the chief reason for the 1932-3 South Australian wheat crop failing to give the record yield that had been anticipated was attack by red rust (*Puccinia graminis*). In respect of resistance the two outstanding varieties were Ford and Sword, which in practically all stands ripened good quality grain. Gluyas, hitherto regarded as very resistant, was badly affected.

RADULESCU (E.). **Zur physiologischen Spezialisierung des Weizenbraunrostes (*Puccinia triticina* Erikss.).** [On physiologic specialization in brown rust of Wheat (*Puccinia triticina* Erikss.).]—*Kühn-Arch.*, xxxiii, pp. 195-205, 1933. [Abs. in *Plant Breeding Abstracts*, Imper. Bureau of Plant Genetics, iii, 3, p. 103, 1933.]

Forty-nine collections of brown rust (*Puccinia triticina*) were examined, of which 37 originated in Rumania [*R.A.M.*, xii, p. 426], and the rest in Germany, Sweden, Finland, and Greece. From the 37 Rumanian cultures ten forms were isolated, eight of which have previously been found in Europe, 13 and 20 being the most frequent. The determination of the forms from other countries agrees with that made by Scheibe [*ibid.*, ix, p. 767]. Form 15 was isolated from Greek material.

LOWIG (E.). **Über den Einfluss des K-Ions und der Kalisalz-Anionen auf die Widerstandsfähigkeit der Getreidearten gegen den Befall von Erysiphe graminis.** [On the influence of the K-ion and of the potash salt anions on the resistance of cereals to attack by *Erysiphe graminis*.]—*Ernähr. der Pflanze*, xxix, 9, pp. 161–165, 9 figs., 1933. [English summary on p. 179.]

A tabulated account is given of the writer's investigations, at the Bonn-Poppelsdorf Agricultural Institute, on the effect of potash fertilizers on mildew of cereals (*Erysiphe graminis*) [*R.A.M.*, xii, p. 362]. In the summer of 1930 pot experiments were initiated with the semi-resistant Janetzki and the moderately susceptible Peragis wheat varieties, grown in a mixture of 89 per cent. sand, 1 per cent. peat mould, and 10 per cent. of soil from a plot receiving no potash for 25 years. Supplemental to an adequate basal dressing of nitrogen and phosphoric acid, the plants were given potash in the form of the chemically pure sulphate, chloride, and silicate (0.5 or 1 gm. per pot). Similar experiments were made in the autumn with the winter varieties, Hopetown and Michigan Bronze. In the spring of 1932 the tests were extended to oats and barley in addition to summer wheat, the citrate and carbonate also being used as sources of potash.

It was found that the wheat and barley plants receiving insufficient potash were uniformly infected by *E. graminis*, mostly in such a severe form that scarcely any ears were produced. Liberal applications of potash in any available form resulted in a marked decline in the incidence of mildew, combined with an augmented yield, these effects being most noticeable with the silicate. No mildew was observed on the oats used in the tests, and these plants failed to respond significantly to the potash treatments—a fact interpreted as showing that the beneficial effects on wheat and barley production are an indirect sequel to the prevention of mildew.

The microscopic examination of the treated plants showed a pronounced thickening of the cell membranes, especially the outer ones of the epidermal cells, in the silicate series, accompanied by a heavy ash deposit. These features were not apparent to any significant extent in the carbonate and citrate series. The thickening of the membranes is believed to be the direct cause of the increased resistance of the plants to mildew.

PUGH (GRACE W.), JOHANN (HELEN), & DICKSON (J. G.). **Factors affecting infection of Wheat heads by Gibberella saubinetii.**—*Journ. Agric. Res.*, xlv, 9, pp. 771–797, 10 figs., 2 graphs, 1933.

Continuing their studies on the wheat ear blight caused by *Gibberella saubinetii* [*R.A.M.*, xii, p. 159] the authors give a full report of their field and greenhouse inoculation experiments between 1920 and 1924, the results of which showed that infection was most effective (on pure lines of Marquis and Prelude wheats, which were almost exclusively used) when the ears were sprayed with a conidial suspension of the fungus while blossoming or just after this period, although some infection also resulted from earlier

or later applications. The length of the incubation period was shortest at the higher end of the range of controlled temperatures (from 12° to 32° C.) tested, and also decreased as the plants matured. The fact that, in inoculations made before the blossoming period, the great majority of initial infections occurred in the spikelets that were first to open in the ear, and that infection spread further usually in the same order as that in which other spikelets opened up, is interpreted to indicate that the fungus gains entry through the floral parts rather than that it progresses in the ear through the rachis. It is thought that infection most usually occurs through the anthers or other degenerating tissues, on which the fungus first develops as a saprophyte and from which it spreads to the interior of the flower and to the developing grain. This view is supported by the fact that infection was frequently observed to begin in anthers that had failed to emerge from the glumes, and that a high percentage of the spikelets showing initial infection were found to have retained anthers in them. Retention of the latter is not, however, dependent on infection, since in Marquis wheat the percentage of retained anthers was found to be higher in healthy than in infected ears. There was no evidence that initial infection occurs through the outer surface of the glumes.

PADWICK (G. W.) & HENRY (A. W.). **The relation of species of *Agropyron* and certain other grasses to the foot-rot problem of Wheat in Alberta.**—*Canadian Journ. of Res.*, viii, 4, pp. 349–363, 4 figs., 1933.

During the summer of 1932 a survey was made of several districts in central Alberta to determine the incidence of wheat foot-rotting organisms on grasses. *Helminthosporium sativum*, *Ophiobolus graminis* [R.A.M., xi, pp. 159, 291–294; xii, p. 18], *Colletotrichum* sp., and *Fusarium* sp. were isolated from *Agropyron repens*; *O. graminis*, *H. sativum*, *F.* spp., and a fungus resembling a *Leptosphaeria* from *A. tenerum*; *H. sativum* and *F.* sp. from *Bromus inermis*; and *H. sativum* from *A. richardsonii*. The heaviest infestation was on *A. repens* (practically 100 per cent.), followed by *A. tenerum* (64.3 per cent.), while *B. inermis* showed only 29 per cent. foot rot. It was shown by inoculation experiments [the results of which are tabulated] that the strains of *O. graminis* and *H. sativum* isolated from grasses are equally pathogenic to Marquis wheat with those from the wheat itself. Under certain conditions the strains of *Fusarium* obtained from grasses would probably also attack wheat, but in the tests under discussion they were not highly pathogenic, with the possible exception of the *A. repens* strain.

Artificial inoculation of the various grasses was made by infestation of the soil with strains of *O. graminis*, *H. sativum*, and *F. graminearum* [*Gibberella saubinetii*] from wheat. The [tabulated] results of the experiments showed that all the 12 species of *Agropyron* used in the tests were susceptible to *H. sativum* and also (except one, which was not exposed to infection) to *O. graminis*. Both fungi further attacked *B. inermis* and *B. ciliatus*, while *H. sativum* also infected oats slightly and *O. graminis* was

parasitic on *Hordeum jubatum*. *G. saubinetii* killed a high percentage of the seedlings before emergence, the species affected being oats, *A. elongatum*, *A. repens*, *B. inermis*, and *B. ciliatus*.

In an experiment to determine the relation of *A. tenerum* to the amount of take-all in the following wheat crop, it was found that the latter showed 4.8 per cent. infection by *O. graminis* after this grass, whereas none was present in the crops succeeding brome, timothy (*Phleum pratense*), lucerne, or summer fallow. Other wheat foot-rotting organisms also appeared to be more prevalent after *A. tenerum*, the importance of which in this connexion is evidently considerable.

PITTMAN (H. A.). **Barley smuts and their control.**—*Journ. Dept. Agric. Western Australia*, 2nd Ser., x, 1, pp. 2–8, 3 figs., 1933.

After briefly distinguishing between the symptoms of loose smut (*Ustilago nuda*) and covered smut (*U. hordei*) of barley and stating that while the former is not, apparently, very prevalent in Western Australia, the latter is often very abundant in crops grown from untreated seed, the author recommends formalin sprinkling as the cheapest effective method yet devised for the control of covered smut: directions are given for applying this and other well-known treatments.

HOLTON (C. S.). **Studies in the genetics and the cytology of *Ustilago avenae* and *Ustilago levis*.**—*Minnesota Agric. Exper. Stat. Tech. Bull.* 87, 34 pp., 21 pl., 1932. [Received July, 1933.]

This is the full report of the author's investigation of hybridization between *Ustilago avenae* and *U. levis* [*U. kolleri*], excerpts from which have already been noticed [*R.A.M.*, xi, p. 37; xii, p. 431]. In addition to the information previously given it is stated that artificial inoculations on Anthony, Liberty Hull-less, and Victory oat seedlings with crosses between monosporidial lines of *U. avenae* produced both the loose and covered smuts, while *U. kolleri* only produced the covered smut. Inoculations with crosses between the two species produced both the loose and the covered, and also intermediate types of smut. It was found, further, that one cross may produce the loose and covered smut on one and the same variety of oat or the loose smut on one variety and the covered smut on another or, on the other hand, the same type of smut may be produced by it on as many as three different varieties.

While the production during the investigation of the new buff type of smut [loc. cit.] is considered to indicate the possibility of the formation of new physiologic forms of the oat smut fungi, the fact that sporidia isolated from germinating hybrid smut spores were non-culturable except in very rare cases would tend to show that the likelihood of this process occurring in nature is very remote. There was no definite evidence of mutation either in *U. avenae* or *U. kolleri*, and the variants which appeared as sectors in cultures of monosporidial lines are interpreted as being the result of segregation.

In the brief section dealing with the cytology of the two fungi it is stated that the sporidia, the promycelial cells, the primary

sporidium, and the mycelium in monosporidial cultures of both species are uninucleate. Attempts to stain fusing sporidia were unsuccessful, but according to a statement in an unpublished thesis by Allison fused sporidia initiate the dikaryophase, which is binucleate, and which persists throughout the parasitic stage to the production of smut spores which, when mature, have a single diploid nucleus.

PICHLER (F.). **Der Schneeschimmel. Ursachen und Abwehr seines Auftretens.** [The snow mould. Causes and prevention of its occurrence.]—*Fortschr. der Landw.*, viii, 7, pp. 149–153, 2 figs., 1933.

Four types of cereal fusariosis are recognized by the writer as a result of protracted observations in Austria, namely, (1) attack on the seedlings during germination and emergence; (2) the development of a white, later reddish mould on the winter crops after the melting of the snow; (3) foot rot of the haulm base between flowering and ripening; and (4) infection of the seed in the ear at the same time. Of these, only form (2) can correctly be diagnosed as the 'snow mould' due to *Fusarium nivale* [*Calonectria graminicola*], the others being better collectively grouped as 'fusarioses' irrespective of the specific identity of their agents [*R.A.M.*, xii, p. 278].

The fact that disinfection of the seed-grain is by no means an infallible remedy against the snow mould points to soil infection as an important factor in the development of the disease [*ibid.*, xi, p. 228].

The following recommendations, based on the writer's observations and those of other workers, are made for the control of the snow mould by the avoidance of conditions under which it flourishes. Only absolutely healthy seed-grain of appropriate varieties should be planted. It has been noticed that plants raised from seed originating in high, cold situations thrive on the plains, and that those from shaded regions do well on exposure to sunshine. Generally speaking, varieties deficient in dextrose are resistant to snow mould. The use of large, heavy seed-grain of high germinability is essential; it should be treated before sowing with a standard fungicide (preferably by immersion, which enables the inferior seed-grain to be floated off). Late sowing, fairly wide spacing, shallow cultivation, thorough tillage, and good drainage are all important measures. Potash and phosphoric acid should be applied in the autumn, but nitrogen should not be given (unless seriously deficient in the soil) until after the snow melts in the spring. Where the snow persists for lengthy periods it should be broken up by driving over the field or making holes with sticks, and the melting accelerated by strewing ashes.

TASUGI (H.). **Studies on the physiology of the conidiophores, conidia and oospores of *Sclerospora graminicola* (Sacc.) Schroet. on the Japanese Millet (*Setaria italica* (L.) Beauv.) (Studies on Japanese Peronosporales II.).**—*Journ. Imper. Agric. Exper. Stat.*, Nisigahara, Tokyo, ii, 2, pp. 225–262, 3 pl., 1 fig., 5 graphs, 1933. [Japanese, with English summary.]

After pointing out that *Sclerospora graminicola* is common on

Setaria italica in Japan and Korea, where it is also found on *S. viridis* [R.A.M., x, p. 24], the author states that field observations showed that in fine weather the conidiophores and conidia are always produced on *S. italica* at night, but when light rain falls (or even in fine weather if the affected plants are kept in bell-jars indoors), sporulation occasionally takes place during the day. Affected *S. italica* leaves kept at about 20° C. in a moist chamber near a window produced spores in every case during daylight, so that presence of light is not a limiting factor for the development of the conidiophores and conidia. The conidiophores matured 50 minutes to 2 hours after appearing on the leaves in a moist chamber, while the conidia required a further 1 to 2½ hours; the total time that elapsed between the placing of the leaves in the chamber and the maturation of the conidia amounted to 4 to 8½ hours.

The optimum temperature for the development of the conidiophores and conidia lay between 18° and 20.5°, while the maximum and minimum were, respectively, 35° and 5°.

The conidiophores vary in size and structure according to the temperature and the stage of growth reached by the host. When the plant is very young they are usually short and simple, but as the summer approaches they become larger and more complex; by harvest-time they assume a very complex structure and the length reaches its maximum, being almost double the corresponding measurement in spring. They are small, simple, and regular at temperatures ranging from 5° to 15°, become larger and more complex at 18° to 23°, and at 26° to 30° they are even more so, but are somewhat malformed, occasionally producing knob-like masses of mycelium without conidia.

The conidia vary so considerably in size that sometimes they scarcely seem of the same species. They are small in spring, but gradually enlarge, reaching their maximum size in the middle of August, after which they shrink to the same size as they had in spring. These variations in size appear to be correlated with seasonal temperature. The width to length ratio is high when the conidia are small, but decreases as they become larger.

When the mature conidia are sown in tap water they germinate immediately and liberate 1 to 8 (generally 3 to 4) zoospores. The encysted zoospores measure 9 to 12 μ in diameter. Under unfavourable conditions, such as at temperatures of 5° to 9° or 28° to 30°, or when they are too young or too old, the conidia may germinate only occasionally, and produce germ-tubes instead of zoospores. The optimum temperature for conidial germination is 17.5°, and the minimum and maximum are about 5° and 33.5°, respectively. Near the optimum temperature, the conidia germinate in about one hour, or even less at temperatures slightly above, while at 9° and 5° some germinated after 30 and 72 hours, respectively. They lose their germinating power soon (within 40 minutes) after the disappearance of the film of water from the leaves.

A sufficient supply of free oxygen is essential for oospore germination and a simple method of securing this is described. The oospores germinate 30 to 48 hours after being sown, producing

only a single germ-tube. Germination to the extent of 14.3 per cent. was obtained three days after collection, and 68.6 per cent. after 45 days. The optimum, minimum, and maximum temperatures for oospore germination are, respectively, 20° to 23.5°, about 11.5°, and about 35°. At P_H 2.9 or 3.1 oospore germination is abundant, gradually decreasing as the P_H value rises, until at P_H 9.3 it is very scanty. Exposure to dry heat (50°) for periods ranging from 30 minutes to 4 hours greatly reduced oospore germination (36 and 9.3 per cent., respectively, as compared with 42.7 per cent. in the controls); exposure to wet heat (50°) for periods ranging from 1 to 4 hours inhibited germination. After exposure to 60° dry heat for 10 minutes to one hour very few oospores germinated, and after longer exposures none. Hot water treatment at 60° inhibited germination after 10 minutes.

Oospores treated for 10 minutes with 0.01 per cent. mercuric chloride gave only 12 per cent. germination, no germination occurring when 0.05 or 0.1 per cent. solution was used for the same period. Treatment for 10 minutes to 4 hours with 0.05 and 0.1 per cent. copper sulphate gave a very low percentage of germination, while after exposure for 2½ to 4 hours to 0.5 per cent. copper sulphate no germination occurred.

When stored in dry conditions the oospores continued to germinate readily until the following spring, after which germinative power declined; it ceased 500 to 600 days after collection.

NIKOLAIIEFF (V. A.). Микробиология болезней хлеба. [Microbiology of the diseases of bread.]—Pamphlet issued by Всесоюзн. Научно-Исслед. Инст. Хлебобулочной Промышл. [Pan-Soviet Scientific Res. Inst. Bread-baking Indus.], Leningrad, 48 pp., 18 figs., 1932. [Received July, 1933.]

By far the greater part of this pamphlet is given to a discussion of the troubles of bacterial origin that develop in badly stored wheat and rye bread, with a detailed description of the morphological and cultural characters of the organisms, and a few recommendations for their control. Besides that due to *Micrococcus* [*Bacillus*] *prodigiosus*, a red discoloration of the crumb is also caused by *Oidium aurantiacum* [*Neurospora sitophila*] and *Thamnidium aurantiacum*, both of which are stated to be innocuous to man. Among the fungal troubles described mention may be made of a 'chalky' condition of both wheat and rye bread crumb caused by two fungi first described by Lindner in 1908, namely *Endomyces fibuliger* and *Monilia variabilis*; and of various common moulds, among which *Penicillium glaucum*, *Aspergillus glaucus*, and *Rhizopus nigricans* are stated to be the most widespread.

JENKINS (ANNA E.) & FAWCETT (H. S.). Records of *Citrus scab* mainly from herbarium specimens of the genus *Citrus* in England and the United States.—*Phytopath.*, xxiii, 5, pp. 475–482, 1 fig., 1933.

The result of the examination of phanerogamic herbarium specimens of *Citrus* in England and the United States support the view that citrus scab (*Sphaceloma fawcettii*) [see above, p. 595] originated and was present in the Orient at an early date. A

Javanese specimen dated 1840 appears to constitute the earliest specimen record of the disease, though Tanaka refers to a mention of it in Japan in an unpublished manuscript written by Y. Murase in 1818 [cf. *R.A.M.*, iii, p. 269].

The present known range of citrus scab appears to be considerably wider than was reported in 1926 by Fawcett and Lee [*ibid.*, v, p. 735], the disease occurring in eastern and southern Asia, Oceania, Australia, New Zealand, Africa, the United States, the West Indies, Mexico, the Canal Zone, and South America. It is stated that Fawcett obtained infection at 24.5° and 27.5° C. in a test in which the infection period was prolonged, so that the occurrence of scab under natural conditions at these temperatures is evidently not precluded [cf. *ibid.*, v, p. 420].

MAIRE (R.), FOËX (E.), & MALENÇON (G.). **Sur l'étiologie du baioud, maladie du Palmier Dattier.** [On the etiology of the baioud disease of the Date Palm.]—*Comptes rendus Acad. des Sciences*, cxvi, 19, pp. 1349–1350, 1933.

At the instance of the Moroccan (French Protectorate) Government, the writers investigated the 'baioud' disease of date palms (*Phoenix dactylifera*) in different localities. Following the detection of the conidia of *Cylindrophora albedinis* [*R.A.M.*, x, p. 654] in the vascular tissues of infected palms in the Tafafilet area, similar observations were made at Tinift and Bou-Denib. The organism is most abundant at the bases of the rachids, especially in cases of recent attack. At this point no reddening is apparent: on the contrary, the parenchyma surrounding the vessels assumes a translucent aspect, so that the surface of the affected area looks whitish and opaque, with scattered water-soaked spots. In the early stages of infection the mycelium is confined to the vascular and fibrous tissues, and the conidia are sometimes formed in such profusion as to obscure the cavity of the large vessels. The parenchyma is not invaded until much later, and in this tissue conidial production is much more sparse. Any of the cavities arising in the tissues through various processes are liable to be filled with conidia, a fact that readily explains the spread of the disease from tree to tree, e.g., by pruning implements and possibly by insects.

The examination of very recent cases of baioud showed that infection originates at the leaf bases and spreads rapidly upwards in the bud, progress towards the trunk and in a transverse direction being slower. In this way fresh vascular areas are continuously involved in the infection, the leaves are successively destroyed, and the tree dies with the invasion of the vascular tissues of the terminal growing point. The disease may be described as a tracheomycosis. A high degree of tolerance is manifested by the Khalt variety.

MAIRE (R.) & MALENÇON (G.). **Le belaât, nouvelle maladie du Dattier dans le Sahara algérien.** ['Belaât', a new disease of the Date in the Algerian Sahara.]—*Comptes rendus Acad. des Sciences*, cxvi, 21, pp. 1567–1569, 1933.

The writers recently investigated a disease locally known as

'belaât' or 'suffocation' of date palms (*Phoenix dactylifera*) in the Biskra and Oued-Rir districts of Algeria presenting certain superficial analogies with 'baïoud' [*Cylindrophora albedinis*: see preceding abstract]. Both disorders are characterized by a white discoloration of the leaves which in 'belaât', however, attacks the entire central bunch of leaves at once instead of beginning with a single subterminal leaf, as in 'baïoud'. Moreover, in the new disease the whole leaf is affected from the onset, whereas *C. albedinis* may long be restricted to one side. Recovery sometimes occurs by the production of a new shoot from a subterminal bud. The disease is much less serious than 'baïoud' and occurs chiefly in neglected plantations.

Recently infected palms show a rapidly progressing, wet heart rot originating near the growing point. The more or less lignified tissues immediately below the decayed terminal bud assume a uniform vinaceous tint and undergo progressive delignification until their final transformation into a greenish-yellow mass of caseous consistency, saturated with water. The diseased tissues have a pronounced odour of acetic and butyric fermentation. The decay of the trunk extends downwards with diminishing intensity, forming a sort of inverted cone sharply delimited from the healthy tissues by a narrow brown zone. This process results in the asphyxiation and decomposition of the terminal bud and of the bases of the surrounding leaves, which become discoloured. The reddish-brown lines found in the rachids of palms affected by 'baïoud' are absent from those attacked by 'belaât'.

The microscopic examination of non-decomposed tissues disclosed a mycelium of continuous, torulose, intercellular hyphae, provided with occasional intracellular haustoria, and also subglobular cysts, with a thick, smooth membrane, scattered through the parenchyma cells. The mycelium sometimes forms small, creamy-white, velvety masses, consisting of mingled hyphae and cysts, in the basal tissues of diseased leaves, from which pure cultures of a *Phytophthora* with obpiriform conidia were obtained. These spores generally arose singly from the apex of an elongated stalk, which sometimes branched sympodially, the branches then forming other conidia. The fungus appears to be distinct from *P. palmivora*, the causal organism of bud rot of palms in India [*R.A.M.*, iv, p. 414; x, p. 361], with which the 'belaât' has certain features in common. The decay of the tissues initiated by the *Phytophthora* is completed by numerous saprophytes (*Mucorales* and yeasts) which soon produce fermentation and total liquefaction of the tissues.

McNAMARA (H. C.) & HOOTON (D. R.). **Sclerotia-forming habits of the Cotton root-rot fungus in Texas black-land soils.**—*Journ. Agric. Res.*, xlii, 9, pp. 807-819, 5 figs., 1933.

The results of a careful search [by a method which is described] during the summer and autumn of 1931 for sclerotia of *Phymatotrichum omnivorum* [*R.A.M.*, xii, p. 566] in the black clay soils of Texas, around the cotton plants that were the first to die from root rot, showed that these bodies did not occur in fields planted continuously to cotton, while they were numerous (usually in colonies or groups) in fields returned to cotton after three- or four-

year clean fallows and also in fields where cotton followed three years of non-susceptible crops. No sclerotia were found on the tap or large lateral roots of cotton, but only in the soil surrounding the small rootlets, and older sclerotia were also found at depths of 4 to 18 inches below the plough sole, most of them occurring at a depth of 4 to 12 inches. They also occurred (frequently in large numbers) near old tree roots or stumps that had been dead for many years. After the seat of infection in a primary centre had been located, continued digging failed to show other sources of infection.

These observations suggest that the sclerotia, which apparently are capable of long periods of quiescence, are connected primarily with the saprophytic stage of the organism, and serve as resting organs. They also indicated that where deep-seated infection exists, clean fallow or crop rotation as a method of control apparently needs supplementing by tillage operations that will reach the sclerotia.

McNAMARA (H.), WESTER (R. E.), & GUNN (K. C.). **Persistent strands of the root-rot fungus in Texas.**—*Science*, N.S., lxxvii, 2004, pp. 510–511, 1933.

The examination of numerous primary centres of root rot (*Phymatotrichum omnivorum*) in continuous cotton plots in Wilson and Houston clay soils at Greenville, Texas, during 1931–2 showed that the fungus overwinters in the soil mainly as strands rather than in the sclerotial stage [see preceding abstract]. The strands were mostly found among the old, dead roots of plants killed by them the year before or earlier. New growth was readily made by some old strands found in 1932 on decayed cotton roots destroyed three years previously, as well as in the empty root channels of former plantings. Old strands found interlacing a colony of sclerotia in a plot that had been in clean fallow for five years were also viable.

The growth of the hyphae produced from the ends of old strands was characterized by radiating or parallel development of elongated cells which anastomose freely in the early stages. Later these structures were replaced by the more typical acicular hyphae with rectangular branches. The older strands consist of an outer cortical ring of thick-walled, irregular cells enclosing large, elongated, thin-walled, septate cells. In contrast to the more deeply seated infections of the far south-west, the strands at Greenville were found to be most abundant in the surface foot of soil, where they are relatively accessible to tillage operations or disinfectants.

HARDING (D. B.) & GARR (C. C.). **Blastomycosis of bone.**—*Southern Med. Journ.*, xxvi, 4, pp. 315–320, 8 figs., 1933.

Clinical details are given of ten cases of blastomycosis of the bones (caused by one or more species of *Blastomyces*) [cf. *R.A.M.*, xii, p. 441], all in adults between 35 and 72 years old and half among farmers or farm labourers handling tobacco in Kentucky. The condition occurs either as a primary infection or secondary to lesions in other parts of the body, usually the skin or lungs. The symptoms resemble those of acute osteomyelitis at the onset, while

chronic osteomyelitis and tuberculosis are simulated in the chronic stages. The generalized infections are fatal.

NIÑO (F. L.) & PÉREZ (B.). **Blastomykose der Schleimhaut des Zahnfleisches und der Wangen.** [Blastomycosis of the mucous membrane of the gums and cheeks.]—*7^a Reunion Soc. Argentina Patol. Region. Norte*, i, pp. 413–423, 2 pl., 10 figs., Buenos Aires, Imprenta Univ., 1932. [Abs. in *Zentralbl. für Bakt.*, Ab. 1 (Ref.), cx, 9–10, p. 212, 1933.]

During the last two years the writer examined four cases of blastomycosis, of which the first was caused by *Cryptococcus psychrophilicus* [*R.A.M.*, xi, p. 644] and the others by *Mycoderma* [*Endomyces*] *dermatitidis* [*ibid.*, xii, p. 441]. The case under discussion was one of blastomycetic granuloma (? also due to *E. dermatitidis*), which yielded to auto-vaccination.

VIVOLI (D.), AVELLANEDA (R.), & DE BARBIERI (ESTHER). **Glossitis ulcerosa, verursacht durch *Monilia argentina* (n. sp.).** [Glossitis ulcerosa caused by *Monilia argentina* (n. sp.).]—*7^a Reunion Soc. Argentina Patol. Region. Norte*, i, pp. 239–277, 37 figs., Buenos Aires, Imprenta Univ., 1932. [Abs. in *Zentralbl. für Bakt.*, Ab. 1 (Ref.), cx, 9–10, p. 214, 1933.]

A detailed account is given of the morphological and physiological characters of *Monilia argentina* n. sp., which was responsible for ulcerous glossitis in a 48-year-old male patient [cf. *R.A.M.*, xii, p. 441]. The fungus was isolated from abscesses on the tongue and lymph glands and inoculated into rats with positive results.

ROGERS (J. B.) & JELSMAN (F.). ***Torula meningo-encephalitis.***—*Journ. Amer. Med. Soc.*, c, 10, pp. 1030–1031, 1933.

Clinical details are given of a fatal case of meningo-encephalitis in a 47-year-old man caused by a species of *Torula* with budding cells 2 to 12 μ in diameter [cf. *R.A.M.*, xii, p. 94].

BONAR (L.) & DREYER (ALICE D.). **Studies on ringworm funguses with reference to public health problems.**—*Amer. Journ. Public Health*, xxii, 9, pp. 909–926, 4 figs., 1932.

Trichophyton interdigitale [*T. mentagrophytes*: *R.A.M.*, x, p. 243], a common agent of ringworm in American public baths, outdoor pavilions, and the like [*ibid.*, xii, p. 569], developed readily on floor material covered with slime or algal growth. The complete destruction of the organism in skin scales by a 1 per cent. sodium hypochlorite solution [*ibid.*, xii, p. 509] requires a period of one hour or more. In a series of thermal death point studies on spore suspensions of *T. mentagrophytes*, *Microsporon lanosum*, *Epidermophyton cruris* [*E. floccosum*], and *T. rosaceum* [*ibid.*, xii, p. 173], the organisms were killed by ten minutes' exposure to 75° C. or below, *T. mentagrophytes* being the most resistant.

MUSKATBLIT (E.). **Ringworm of the toes in students and dispensary patients.**—*New York State Journ. of Med.*, xxxiii, 10, pp. 632–637, 1933.

An examination for ringworm of the toes was conducted on 100

dispensary patients and 112 medical students selected at random. Fungi were found microscopically or obtained in cultures in 31.6 per cent. of all the cases examined. Even when the fungi could not be detected microscopically, 5.2 per cent. yielded cultures. The commonest organism was *Epidermophyton interdigitale* [R.A.M., xii, p. 444], followed by *E. [Trichophyton] rubrum* [ibid., xii, p. 509], *E. inguinale* [*E. floccosum*], and *T. gypseum*, while an important part was apparently also played by *Oidium rotundatum* Cast., *Monilia*, and *Cryptococcus* spp. A case of mixed infection by *E. interdigitale* and *Monilia* is described.

MUSKATBLIT (E.) & DIRECTOR (W.). **The trichophytin test: report of three hundred and fifty cases.**—*Arch. of Dermatol.*, xxvii, 5, pp. 739-744, 1933.

A method of preparation of a polyvalent fungous extract containing endo- and exo-products of *Epidermophyton interdigitale*, *Trichophyton violaceum*, and *Microsporon audouinii* is described. The extract (0.1 c.c.) was injected intradermally into the forearms of 350 patients, 300 of whom were clinically mycotic, with positive results in 72.3 per cent. of the cases proved mycotic by laboratory examination. The cases in which the pathogen proved to be *E. interdigitale* reacted most readily to the test (22 out of 23), *E. [Trichophyton] rubrum* giving a positive reaction in 6 out of 9 cases, and *M. lanosum* in 7 out of 8. Six out of 12 cases of *Monilia* infection also gave a positive reaction.

It may be concluded from these results that the intradermal test with fungous extracts, while not absolutely specific, is of considerable value in the diagnosis of dermatomycoses, a high degree of cutaneous allergy being produced especially by *E. interdigitale*.

BROCHET (L.) & WILHELM. **Mycose cutanée observée à Teheran.** [Cutaneous mycosis observed at Teheran.]—*Fol. Med. Int. Orient.*, i, pp. 104-105, 1932. [Abs. in *Zentralbl. für Bakt.*, Ab. 1 (Ref.), cx, 9-10, p. 203, 1933.]

A description is given of the so-called 'carate' disease of the skin [R.A.M., xii, p. 173], which occurs at Teheran in a similar form to that observed in Ceylon by Castellani and attributed by him to *Trichophyton ceylonense* (1908).

NIÑO (F. L.). **Mikrosporon-Trichophytie des behaarten Kopfes durch Ektothrix.** [*Microsporon trichophytosis* of the scalp caused by ectothrix.]—7^a *Reunion Soc. Argentina Patol. Region. Norte*, i, pp. 384-400, Buenos Aires, Imprenta Univ., 1932. [Abs. in *Zentralbl. für Bakt.*, Ab. 1 (Ref.), cx, 9-10, p. 202, 1933.]

Three juvenile patients were affected by a disorder of the scalp, characterized by brittleness and dullness of the hair, yellow, ulcerating crusts at the roots, and patches of baldness. Spores were observed in profusion on the diseased hair and on the ulcers; on Sabouraud's agar they developed into polymorphic hyphae, septate spindles, up to 50 by 15 μ , being also present in older cultures. The fungus, which was inoculated into laboratory animals

with positive results, is considered to be a new species allied to *Microsporon felineum* and *M. flavescens*.

TALICE (R. V.) & MACKINNON (J. E.). **Drei Fälle von Pilzerkrankung des Ohres durch *Aspergillus* aus Montevideo.** [Three cases of fungous disease of the ear due to *Aspergillus* from Montevideo.]-7^a Reunion Soc. Argentina Patol. Region. Norte, i, pp. 278-284, Buenos Aires, Imprenta Univ., 1932. [Abs. in *Zentralbl. für Bakt.*, Ab. 1 (Ref.), cx, 9-10, p. 206, 1933.]

Three cases of otomycosis were investigated in Montevideo, from each of which a different species of *Aspergillus* was isolated, viz., a blackish variant of *A. niger*, a greenish-yellow variant of *A. flavus-oryzae*, and a new species, *A. montevidensis*, allied to *A. repens* and *A. amstelodami* [*R.A.M.*, x, p. 597].

AIMÉ (P.), CREUZÉ (P.), & KRESSER (H.). **Mycose pulmonaire à 'Penicillium crustaceum' avec signes cliniques et aspect radiologique d'abcès du poumon.** [Pulmonary mycosis due to *Penicillium crustaceum* with clinical symptoms and radiological aspect of an abscess of the lung.]-*La Presse Méd.*, xli, 37, pp. 761-763, 5 figs., 1933.

Full clinical and radiological particulars are given of a severe case of pulmonary mycosis in a female patient in France caused by *Penicillium crustaceum*. The fungus formed on liquid media a thick, dry, bluish-green mycelium (whitish under the microscope) of a felty consistency, producing chains of spherical or elliptical, whitish conidia. A cure was effected by means of potassium iodide. This is believed to be only the third record of the involvement of *P. crustaceum* in the causation of lung trouble [cf. *R.A.M.*, vi, p. 483; xii, p. 511].

TRANZSCHEL (V.), GUTNER (L.), & KHOCHRYAKOFF (M.). **Список грибов, встречающихся на новых культурных прядильных растениях.** [List of fungi occurring on new cultivated textile plants.]-*Изв. Нового Лубяного Сырья ВАСХНИЛ*. [*Inst. New Bast Raw Material VASKhNIL*], Leningrad, No. 1, pp. 127-140, 1933.

This is a list, arranged by the hosts, of the parasitic fungi that have been described on the following fibre-producing plants which are stated to be recent introductions into cultivation in Russia, namely, *Apocynum* sp., *A. cannabinum*, *A. androsaemifolium*; *Boehmeria nivea*, *B. candidissima*, *B. cylindrica*, *B. japonica*, *B. tenacissima*; *Hibiscus cannabinus*; *Abutilon avicennae*, *A. hybridum*, *A. sordidum*, *A. theophrasti*; *Dipsacus fullonum*, *D. pilosus*, *D. sylvestris*; *Cannabis sativa*; *Asclepias coriati*, *A. curasavica*, *A. fruticosa*, *A. incarnata*, *A. pneumonanthe*, *A. variegata*, *A. verticillata*, and an undetermined species of this genus. The following species of fungi included in the list are described by Khokhryakoff [transcribed by the author in the diagnoses as Chochrjakow] as new to science. *Septoria apocyni*, which forms

on the stems of *A. venetum* whitish, oblong or oval, rarely discrete spots; the pycnidia are brown, 150 to 200 μ in diameter, and contain four-celled stylospores, measuring 25 to 46 by 3 to 4 μ . In association together and with other fungi on the leaves of *B. nivea* were found the three new species *Coniothyrium boehmeriae* with pycnidia up to 90 μ in diameter and fuliginous, continuous stylospores measuring 6 to 7.5 by 3 μ ; *Hendersonia boehmeriae* with pycnidia up to 77 μ in diameter and four-celled, fuliginous stylospores measuring 13 to 15 by 4 to 5 μ ; and *Microdiplodia boehmeriae* with pycnidia up to 80 μ in diameter and two-celled, fuliginous pycnosporos measuring 7 to 9 by 3 to 3.5 μ . *Ascochyta hibiscicannabini* n. sp. formed on the leaves of *H. cannabinus* amphigenous, greyish-brown, rounded, sharply delimited spots, up to 10 mm. in diameter; the pycnidia are epiphyllous, light brown, up to 180 μ in diameter, and the stylospores hyaline, cylindrical, rounded at both ends, first continuous, later two-celled, and 5 to 10 by 2.5 to 4.5 μ . *Coniothyrium abutilonis* n. sp. forms on the leaves of *A. avicennae* greyish-brown or ochre-coloured spots up to 5 mm. in diameter, with an indistinct dark margin; the pycnidia are epiphyllous, dark brown, more or less aggregated or dispersed, and 50 to 150 μ in diameter, containing elliptical, fuliginous stylospores, measuring 6 to 7 by 3 to 3.5 μ . *Leptosphaeria abutilonis* forms on the leaves of the same host small, greyish-brown spots with a dark margin, and occurs in association with *Ascochyta abutilonis*; its perithecia are dark brown, occasionally aggregated, and 120 to 1,250 μ in diameter, with asci 55 to 62 by 9 to 12 μ , and spindle-shaped, light yellow spores, with 5 septa, acute at both ends, straight or bent, 24 to 30 by 4.5 μ . *M. abutilonis* n. sp. occurred also on the leaves of this host on which it forms whitish spots with a thin dark margin; the pycnidia are 75 to 150 μ in diameter, and have thin, translucent walls, and the stylospores are two-celled, slightly constricted, fuliginous (brown in mass), and measure 6 to 8 by 3 to 3.5 μ . A fuller description of these fungi is reserved for a future publication.

ALLEN (RUTH F.). **The spermatia of Flax rust, *Melampsora lini*.**
—*Phytopath.*, xxiii, 5, p. 487, 1933.

This is an expanded note of the writer's studies on heterothallism in flax rust (*Melampsora lini*), an abstract of which has already been noticed [*R.A.M.*, xii, p. 362]. In infections fixed shortly after smearing spermatial exudate on the leaf surface, the spermatium has been observed to flatten down on to the epidermal wall, to which it becomes attached by a secretion, and it then pushes out a fine beak that penetrates the wall diagonally, in all probability partly by mechanical force and partly by enzymatic action. The spermatium enters and traverses the epidermal cell, possibly being conveyed passively by cytoplasmic streaming. At this stage many spermatia die, perhaps as a result of defensive action on the part of the host, but a few apparently survive. At the inner wall the process described above is repeated, but the beak of the spermatium after penetrating the wall develops into a hypha in the intercellular spaces.

COOK (H. T.) & WALKER (H. G.). **Rose diseases and insects and their control.**—*Virginia Truck Exper. Stat. Bull.* 79, pp. 1053–1066, 6 figs., 1932. [Received July, 1933.]

Popular notes are given on the following diseases affecting roses in the United States, with directions for their control: powdery mildew (*Sphaerotheca pannosa* var. *rosae*), black spot (*Diplocarpon rosae*), anthracnose (*Sphaceloma rosarum*) [*R.A.M.*, xii, p. 447], rust (*Phragmidium* spp.), brown canker (*Diaporthe umbrina*) [*ibid.*, xii, p. 291], brand canker (*Coniothyrium wernsdorffiae*), stem canker (*C. fuckelii*) [*Leptosphaeria coniothyrium*: *ibid.*, xi, p. 767], cane blight (*Botryosphaera ribis* var. *chromogena*) [*ibid.*, x, p. 792], crown gall (*Bacterium tumefaciens*), and blossom blight (*Botrytis* sp.).

Die Welkekrankheit der Atern. [Wilt disease of Asters.]—*Blumen- und Pflanzenbau*, xlviii, 5, p. 72, 1933.

Among the most serious diseases of asters in Germany are the two forms of wilt, one caused by *Fusarium* spp. (including *F. dianthi*, *F. roseum* [*Gibberella saubinetii*], and *F. culmorum*), and the other ('yellow wilt') by *Verticillium cinerescens* [*R.A.M.*, ix, pp. 6, 37; xii, p. 448]. The former is the more prevalent of the two. For the first time seeds of varieties reputed to be completely resistant to wilt have been placed on the market during the current season by the firm of A. Hoch, Berlin-Neukölln.

HALL (A. D.). **The transmission of Tulip breaking.**—*Gard. Chron.*, xciii, 2420, pp. 330–331, 1 fig., 1933.

In 1932 the tulip breaking [*R.A.M.*, xii, p. 292] experiments carried out by McKenny Hughes at the John Innes Horticultural Institution were mainly concerned with the aphids transmitting infection. Insect-proof greenhouse compartments were planted with blocks of four varieties, viz, Prince of Austria, Clara Butt, Bartigon, and Zulu, 100 in each block, the same number being planted elsewhere as controls. When the buds were beginning to open, several pots of growing broken tulips, on the leaves of which a particular aphid colony had been established, were introduced into each compartment.

As in previous tests, *Myzus persicae* proved to be the most active vector, conveying the floral symptoms of breaking to 14 out of 50 Bartigons while a number of other plants were so weakened that they failed to flower, and some were killed outright. *Macrosiphum gei* caused definite breaks in a small number of plants and *Anuraphis tulipae* was implicated as a carrier of infection in store, where it passes from broken to healthy bulbs.

Further experiments showed that tulips do not transmit the virus from the leaves to the newly forming bulbs, as they approach maturity, infective aphids applied to a batch of Bartigon just when the petals were beginning to drop, and again a week later to a second batch, failing to transmit infection to the new bulbs.

Several of the bulbs infected by *Myzus persicae* from 'full breaks' gave 'self breaks', the virus responsible for the latter being evidently independent of that causing the ordinary full

breaking. The Zulu bulbs infected from full breaks showed 'clotted' breaks, which also developed in another test with the Isis variety. However, when aphids were fed on clotted breaks and placed on Bartigon they induced the ordinary full breaks. It is tentatively concluded that clotting is the form taken by breaking in tulips such as Zulu or Isis, with an intense crimson or purple colour and a smooth, shiny texture, on which full breaking has not been observed.

KOLBE (R. W.). **Allgemeines über die Anzucht der Orchideen aus Samen.** [General observations on the raising of Orchids from seed.]—*Blumen- und Pflanzenbau*, xlviii, 5, pp. 64–65, 3 figs., 1933.

An account is given of the symbiotic relationship between orchids and root fungi [*Rhizoctonia* spp.], and of the adaptation of Clement's methods of raising the plants [*R.A.M.*, v, p. 758] on a commercial scale by a German firm 'Orchidflora' (H. Kruffy, Neubabelsberg).

VAN BEYMA THOE KINGMA (F. H.). **Beschreibung einiger neuer Pilzarten aus dem Centraalbureau voor Schimmelcultures—Baarn (Holland.)** [Description of some new species of fungi from the Centraalbureau voor Schimmelcultures—Baarn (Holland).]—*Zentralbl. für Bakt.*, Ab. 2, lxxxviii, 5–7, pp. 132–141, 9 figs., 1933.

Morphological and cultural details are given of seven new species of fungi identified by the writer at the 'Centraalbureau voor Schimmelcultures'. *Sclerotium cacticola* n. sp., isolated from the roots of an *Opuntia* in a living-room, is characterized by spherical to potato-shaped, greyish-white to brownish sclerotia, 1 mm. in diameter (up to 2 mm. in pure cultures on beer wort agar), which assume a pale, coffee colour after about nine months. The mycelium on the same medium is white (later greyish), fibrous, and radiating in all directions; at the periphery of the colony the hyphae project up to 3 mm. above the surface of the agar and form loose, white, paintbrush-like heads. The growth of the infected plant was completely arrested.

HÖHNEL (F. v.). **Über *Volutella buxi* (DC.) Berk.** [Note on *Volutella buxi* (DC.) Berk.]—*Mitt. Bot. Inst. Tech. Hochschule Wien*, ix, 2, pp. 44–46, 1932. [Received July, 1933.]

In this brief posthumous note the author states that *Volutella buxi* [a parasite of box (*Buxus sempervirens*): *R.A.M.*, x, p. 34] does not really belong to this genus, and creates for it a new genus *Chaetodochium* [a German diagnosis of which is given] with *C. buxi* (DC.) Höhn. as the type species. An examination of the type specimen of *Chaetostroma buxi* Cda var. *rusci* Desnazières showed that this fungus also should be referred to the new genus under the name *C. rusci* (Desm.) Höhn.; it appears to be distinct from *Volutella rusci* Sacc.

Chaetodochium has parenchymatous, hemispherical, hyaline or light-coloured sporodochia, covering the stomata of the host and

arising from a hyaline, parenchymatous fungal tissue which fills the stomatal chamber. Hyaline setae develop at the margin of the sporodochium, the surface of the latter being covered with simple conidiophores on which hyaline, continuous, elongated to spindle-shaped conidia are borne.

SANFORD (G. B.). **A root rot of Sweet Clover and related crops caused by *Plenodomus meliloti* Dearness and Sanford.**—*Canadian Journ. of Res.*, viii, 4, pp. 337–348, 2 pl., 2 graphs, 1933.

Sweet clover (*Melilotus alba*), lucerne, and common clover (*Trifolium pratense*) in Alberta and Saskatchewan are subject to a disease caused by *Plenodomus meliloti* [*R.A.M.*, xi, p. 303] for which the name 'brown root rot' is proposed. The first symptom is the formation of brown, slightly sunken, necrotic lesions on the tap or lateral roots and rootlets, infection from which spreads rapidly throughout the tissues, especially the pith, as soon as the surface soil thaws after winter. The lesions frequently involve the lower two-thirds or three-quarters of the root system, but new crown roots and shoots are often produced, so that partial recovery may occur. *P. meliloti* appears to be indigenous in the cultivated black soils of the prairie areas under observation.

The uni- or multilocular pycnidia [*ibid.*, x, p. 110] are formed in dense clusters both on the host and in culture. The pycnosporos are usually produced when the pycnidium is about 50 days old and are liberated through one or several ostioles 30 to 50 days later. The young hyphae are hyaline and closely septate, turning brown and thick-walled with age; they measure 2 to 5 μ in width. The temperature range for growth and pycnidial production in *P. meliloti* is from 0° to 27° C., with an optimum between 15° and 17°. Severe lesions are formed on inoculation of overwintered plants at 2° to 3°, 9°, and 16°. The optimum hydrogen-ion concentration is P_H 6.2 with a range extending from 3.2 to 8.2. These data explain the prevalence of brown root rot in the typically black or wooded soils with a reaction of P_H 6 to 7, and its absence from the alkaline brown soils of the prairie belt.

It was shown by experiments that unfrozen roots of sweet clover, up to four months old, are immune from *P. meliloti* at soil temperatures from 12° to 27°, and also that first-year roots of sweet clover and lucerne are not susceptible to the fungus before winter dormancy. During or just after winter, however, all inoculations on both hosts at the low soil temperature then prevalent gave positive results. In the case of clover the observations were complicated by the occurrence of severe winter injury, but typical brown root rot lesions were produced by *P. meliloti* on the relatively winter hardy Late Swedish Red and Alta-swede varieties. So far sweet clover appears to be the most susceptible of the three hosts, the following varieties being affected: Arctic, Common White, Maccor, Zouave, Grundy. The Grimm, Baltic, Chernob, and Cossack lucernes are susceptible as well as nine clover varieties, including the above-mentioned and Mammoth. Pycnidia have

also been found during May on dead roots of *Axyris amaranthoides*, *Amaranthus retroflexus*, and oats.

A culture of *P. meliloti* on sterilized soil was found to be still viable after 20 months in the laboratory, when the moisture content of the soil was only 4.4 per cent. of its water-holding capacity. Probably the wind is the most effective agent in the dissemination of the brown root rot organism, the sole means of combating which would appear to be either by crop rotation or by the use of resistant varieties.

PELTIER (G. L.). **The relative susceptibility of Alfalfas to wilt.**
—*Nebraska Agric. Exper. Stat. Res. Bull.* 66, 16 pp., 1933.

The results of continued tests of strains and varieties of lucerne of various origin for resistance to wilt (*Aplanobacter insidiosum*) [*R.A.M.*, x, p. 525, xii, p. 221; and above, p. 615] confirmed the resistance of the Turkestan strains originating from the districts of Khiva, Chimbai, Alma-ata, Tashkent, Samarkand, and Chardzhui both to the disease and to cold, while those from the districts of Bukhara, Ashkhabad, and Ferghana were found not to be sufficiently hardy for Nebraska conditions, the same applying to several strains from Persia and one from India. Hardistan and a recently described new variety Kaw, both of which are probably strains of Turkestan lucerne, appear to be promising because of their resistance to wilt and cold. All the other varieties and strains tested, irrespective of origin, were found to be susceptible to the disease.

BRADFORD (F. C.) & JOLEY (L.). **Infectious variegation in the Apple.**—*Journ. Agric. Res.*, xlii, 10, pp. 901-908, 1 fig., 1933.

A brief account is given of a variegation, consisting of small yellow or cream-white spots of irregular shape, which was first observed in the spring of 1928 at the Michigan Agricultural Experiment Station on the leaves of single- or double-grafted Red Canada (Steele Red) apple trees. The appearance was exactly similar to that reported and figured in 1916 by Morse from Maine (*Maine Agric. Exper. Stat. Bull.* 252, 1916) and was probably also the same as in the apple mosaic found in 1923 in New York [*R.A.M.*, iv, p. 15]. Further work, details of which are given, showed that the condition is transmissible by grafting to the intermediate scion and to the rootstock, and variegated Red Canada scions set in mature apple trees produced a variegation which spread throughout the latter to the tips of the ungrafted branches. While none of the apple varieties so far tested was wholly immune, differences were noticed if not in their relative susceptibility, at least in the manifestation of the symptoms, the latter being more pronounced on the seedling rootstocks than in the varieties grafted on them. Buds taken from a tree showing no variegation produced it in seedling stocks. The effect of the condition on the tree has not yet been established.

Reference is made to several early reports of the transmission by grafting of variegation in several woody plants in Europe, especially to one recorded by Vibert in France in 1863 in which

apple trees on which varieties with variegated foliage had been shield-budded produced branches with variegated leaves.

SYLWESTER (E. P.) & COUNTRYMAN (MARY C.). **A comparative histological study of crown gall and wound callus on Apple.**—*Amer. Journ. of Botany*, xx, 5, pp. 329-340, 2 pl., 7 figs., 1933.

The histological development and microchemical reactions of the tissues of crown gall (*Pseudomonas* [*Bacterium*] *tumefaciens*) and non-pathogenic callus knots on apple grafts [*R.A.M.*, xi, pp. 378, 461, *et passim*] were compared at the Iowa State College, the distribution of the bacteria in the former condition also being studied.

The following features were found to be common to both types of overgrowth. The latter consists of proliferated host tissue, derived from tissues external to the xylem cylinder. Within the parenchymatous overgrowth internal differentiation takes place in the form of isolated spheres, whorls, cylinders, or sheets of meristematic cells. Those 'meristematic islands' are characterized by the regular, cambium-like division of the peripheral cells, which produce stratified derivatives on the inside and parenchyma on the outside. The meristematic islands undergo centrifugal differentiation into lignified, contorted xylem elements. In a given island meristematic activity terminates after about three weeks, but new islands arise progressively in the parenchymatous margin of the overgrowth. The enlargement of the latter is effected partly by superficial proliferation and partly by meristematic activity in the internal islands. The microchemical reactions of callus and crown gall are practically identical for cellulose, pectin, lignin, and gums. No true vascular connexion was found between the overgrowth and the tree, the apparent continuity of the woody core of the knot with the main stem resulting from the gradual coalescence and differentiation of the numerous meristematic islands.

The following points of difference were observed between crown gall and callus knots. Near the surface of the former there is usually a zone of dark, polygonal, closely packed cells readily distinguishable from the surrounding parenchyma, whereas the periderm of a graft callus generally resembles that of the normal stem. The tannin test was positive in crown gall tissue and negative in that of the callus knots. Sclerenchyma cells appear to be present only in crown gall. *Bact. tumefaciens* was found in profusion on the surface of the apple galls, in the schizogenous cavities, and in the partially disorganized cells near the surface.

GLOYER (W. O.). **Evaluation of applications of lime-sulphur for the control of Apple scab.**—*New York (Geneva) Agric. Exper. Stat. Bull.* 624, 39 pp., 6 graphs, 1 diag., 1933.

An account is given of the results of three years' tests (from 1930 to 1932) at the New York (Geneva) Agricultural Experiment Station of the relative efficacy of various schedules of spraying with lime-sulphur in the control of apple scab (*Venturia inaequalis*) [*R.A.M.*, xii, p. 451]. A standard method of experimentation

(termed the 'Geneva system') was devised for the evaluation of the treatments which, it is suggested, may be equally useful in all similar tests. As applied to lime-sulphur, it consisted in giving different lots of trees in a Ben Davis orchard from one to five applications of the fungicide as recommended in the usual spraying schedule, the various treatments being arranged in an increasing and decreasing gradation of applications, starting from the first (delayed dormant) spray to the fifth (second cover) in the ascending sequence, and omitting the first, first and second, first, second, and third, &c., spray in each step of the descending sequence, until only the fifth and last spray was applied.

The results of the experiments indicated that lime-sulphur both gives protection against, and has an eradivative action on, the scab fungus, the latter being manifested by the early as well as by the late sprays. Under normal temperature conditions it was found that the apple-leaf cuticle protects the inner tissue from lime-sulphur injury, but when it is ruptured by the scab mycelium, the lime-sulphur penetrates the deeper tissue and kills it within the limited area including the mycelium, a process which has often been considered to be an evil effect of the spray, whereas in reality it indicates its beneficial effect in destroying the parasite. Scab spots may also be eradicated on the fruit during the first cover spray, leaving, however, a russety circular spot of more or less corky tissue; on Ben Davis their formation was only found in tree lots which received the first and second cover sprays.

The investigation showed that the efficiency of lime-sulphur is exerted at three vulnerable stages in the development of scab, namely, (a) it inhibits the germination of the spores if applied prior to a favourable rain period, thus protecting the leaves from infection; (b) initial stages of infection may be partly eradicated by an application as early as possible after a rainy period; and (c) its eradivative function is fully displayed when it is applied at the end of the 12-days' incubation period, when the mycelium has ruptured the cuticle: this function, however, cannot be exerted to its greatest capacity when there are overlapping infection periods. The efficacy of the treatment depends, therefore, on the ability of the grower to synchronize the first application with these vulnerable stages. In the experiments the outstanding feature, as shown by surveys in July and at harvest time, was the efficacy of the delayed dormant (first) and calyx (third) applications (which gave 16.79 and 20.73 per cent. scabbed fruit at harvest time, respectively), as contrasted with the pre-blossom (second) spray, which showed 47.41 per cent. scab on the harvested apples, and which also failed to control the fungus on the leaves. It was also found that the relative efficacy of an application may be greatly altered during the interval between July and the harvest (end of October); this is attributed to the time factor, and is related to the amount of scab remaining on the fruit after the application of a spray. From this standpoint it is suggested that the most reliable information about the date of an infection is to be obtained from the record of the largest scab spot present on the fruit, rather than from the usual classification of scab according to the total scabbed area.

MOORE (M. H.). **Spraying experiments on the control of Pear scab at East Malling.**—*Journ. Min. Agric.*, xl, 2, pp. 111-119, 2 pl., 1933.

An account is given of spraying experiments in 1931 and 1932 at the East Malling Research Station on the control of pear scab [*Venturia pirina*: *R.A.M.*, xii, p. 453] on Fertility pear trees worked on four different stocks of quince. In both years, in which scab was very prevalent, lime-sulphur (1 in 30 pre-blossom and 1 in 60 post-blossom) and burnt lime Bordeaux mixture (8-8-100 both pre- and post-blossom) gave practically equal control; the latter gave a higher percentage of clean fruit, while with the former the spots were smaller though there was more late infection, doubtless owing to the necessity of considerably reducing the strength of the spray in the post-blossom application to avoid injury to the trees. There was some evidence that the pre-blossom application of lime-sulphur may give better control of early infection than Bordeaux mixture, and this method might usefully be tried in orchards where red spider [*Tetranychus telarius*] is prevalent.

Hydrated lime Bordeaux mixture (8-12-100, pre- and post-blossom) was less effective than the burnt lime mixture in 1931 and more effective in 1932. The fact that it is easier to prepare than the latter, and also that in 1931 it caused the lesser injury of the two, indicates that it should be preferred in general practice. A good basic spraying schedule is considered to be three applications of the hydrated lime mixture at 'white bud', 'petal fall', and three weeks later, to be supplemented, if necessary, according to seasonal conditions. The experiments also indicated that the nature of the rootstock affects the relative resistance to *V. pirina* of the trees worked on it [cf. *ibid.*, xii, p. 298], and their reaction to spray treatment.

Colloidal sulphur spray (8 lb. in 100 gall. water pre- and 4 in 100 post-blossom) gave unsatisfactory results in both years.

FIGORE (MARIA). **Ricerche sulla causa di una gommosi diffusasi in alcuni frutteti di Torre del Greco.** [Researches on the cause of a widespread gummosis in some orchards at Torre del Greco.]—*Bull. Orto Bot. R. Univ. Napoli*, x, pp. 5-20, 5 col. pl. [? 1932. Received August, 1933.]

A brief account is given of a disease of fruit trees (apricots, peaches, oranges, &c.) which, according to the statements of local growers, is spreading at an ever increasing rate in the orchards of Torre del Greco, and which they ascribe to the noxious vapours emitted by Vesuvius or to the very hot rains which occasionally fall in that region. Field observations showed that the trouble usually starts in the youngest twigs, the first symptom being a more or less copious exudation of gum, followed by a die-back of the limbs, and terminating in the death of the whole tree in one or two years at the most. New trees planted in the soil from which a dead one was removed usually perish in the same way and this, together with the fact that the roots of diseased trees always show a characteristic orange-pink discoloration, led the author to suspect a parasitic origin of the trouble. This is

considered to be confirmed by the constant presence in the diseased tissues of four fungi, namely, a mycelium of the *Alternaria* type which in pure culture produced conidia typical of this genus, a species of *Fusarium*, pycnidia of the *Phoma* type, and a species of *Ascospora* with membranaceous or carbonaceous, minute, globose or sub-conical, dark brown (almost black) perithecia, from 130 to 180 μ in diameter, containing globose-ovate asci, 22 to 24 by 24 μ , with eight ellipsoidal, continuous, at first hyaline and later slightly pinkish or yellowish ascospores, measuring 8 to 10 by 4 to 6 μ . This fungus is considered to be new to science and is named *A. longi*, a Latin diagnosis being appended.

It is thought that all the fungi mentioned are probably stages in a single life-history.

TRIQUART (J.). **Bekämpfung der Monilia auf Sauerkirschen.** [Control of *Monilia* on sour Cherries.]—*Obst- und Gemüsebau*, lxxix, 5, pp. 73-74, 2 figs., 1933.

Morello cherries are stated to have suffered severe damage in the Palatinate, Rhenish Hesse, and the Frankfurt district of Germany during recent years from infection by *Monilia* [*Sclerotinia cinerea*: *R.A.M.*, x, p. 678]. The Ludwigs Frühe [Early] variety, reputed resistant to the fungus, has the drawback of small fruits and insipid flavour. The writer's extensive observations in Germany, Czecho-Slovakia and northern Hungary indicate that infection by *S. cinerea* is most prevalent in sheltered localities on unsuitable soil [ibid., iii, p. 457]. Strictly sanitary cultivation and the immediate excision of diseased material are essential to control.

Sprøjtning af Stikkelsbærbuske samt Ribs- og Solbærbuske. [The spraying of Gooseberry and of red, white, and black Currant bushes.]—*Statens Forsøgsvirksomhed i Planteavl*, Medd. 146, 4 pp., 1 fig., 1933.

The following is recommended as a suitable summer spraying schedule for the control of gooseberry mildew (*Sphaerotheca mors-uvæ*), gooseberry rust (*Puccinia pringsheimiana*) [*R.A.M.*, xi, p. 262], and *Gloeosporium* [*Pseudopeziza*] *ribis* [ibid., viii, p. 753] and *Septoria ribis* [*Mycosphaerella grossulariae*] on gooseberries and currants in Denmark. (1) Shortly after the bushes come into leaf and again two to three weeks later: alkaline Burgundy mixture; (2) immediately after flowering: the same; (3) directly after picking the fruit: Bordeaux mixture 1:1:100 (primarily against *G. ribis*); and (4) whenever infection by *S. mors-uvæ* is noticed: formalin 0.5:100. Directions are also given for combating the insect pests of these fruits.

SLATE (G. L.) & RANKIN (W. H.). **Raspberry growing in New York State: cultural practises and disease control.**—*New York (Geneva) Agric. Exper. Stat. Bull.* 625, 62 pp., 10 figs., 1933.

This bulletin summarizes in popular language all the work so far done in New York regarding the various cultural practices tending to improve the quality and yield of raspberries, and also the control of the chief diseases affecting the crop [brief descrip-

tions of which are given under their common names]. Considerable space is given to a popular discussion of the virus diseases of raspberries, mostly reproducing information already noticed from other sources [*R.A.M.*, x, p. 530; xi, p. 381].

BONGINI (VIRGINIA). **Una malattia del Nespolo giapponese (*Eriobotrya japonica*).** [A disease of the Loquat (*Eriobotrya japonica*).]—*La Difesa delle Piante*, x, 1, pp. 4-8, 1933.

In the wet, cool summer of 1932, 7- to 8-year-old loquats (*Eriobotrya japonica*) growing in heavy soil about 500 m. above sea level near Turin, some of which had four years previously been subject to an insect attack in the wood, wilted from the base upwards. The bark of the trunk and main branches turned a rusty red and peeled off, while young, growing limbs developed cankers somewhat resembling those due to *Bacillus amylovorus*. The course of the disease was, however, quite unlike that of fire-blight. The wood was brown near the top and a rusty red near the base. The 4- to 5-year-old branches developed longitudinal and transverse cracks in the bark, dividing it into areas of dead tissue, under which was a layer resembling wound callus. The bark was easily detachable and the outer cells of the underlying tissue were suberized, those further in being sclerenchymatous or collenchymatous. In this tissue a copious mycelium was found, which was present also in the detached bark, but not in the cambium or wood. The 1- and 2-year-old branches developed a dark, sunken, elliptical lesion which split longitudinally, revealing dried cracks in the phloem, through which the darkened woody cylinder appeared. Occasionally, the lesion and crack were transverse, in which case the canker quickly girdled the branch. On the affected branches the leaves turned a chlorotic red and dropped, but new shoots were put out in the autumn.

The mycelium in the cortex consisted of intercellular, hyaline, branched, septate hyphae, often in thick wefts, with stromatic masses on the outside. Aggregated, globose, somewhat compressed, glabrous, ostiolate, dark-walled pycnidia developed in the stromatic layers in the cracks of the phloem and on the inner surface of the loosened bark. They measured 87 to 100 μ in diameter and contained rod-shaped, hyaline, non-guttulate stylospores, borne on unbranched stalks and measuring 2.5 by 1 to 1.5 μ , which were extruded in long tendrils. The fungus was not observed on the leaves, though both these and the leaf scars on the branches showed the presence of *Hendersonia eriobotryae*.

The organism, which is regarded as a weak parasite attacking only predisposed trees and, probably, not directly responsible for the cankers, is named *Phoma eriobotryae* n. sp. A Latin diagnosis is given, and there is a bibliography of 12 titles.

TAI (F. L.) & CHEN (C. C.). **A dry rot of Pomegranate fruit caused by *Zythia versioniana* Sacc.**—*Lingnan Sci. Journ.*, xii (Supplement), p. 151, 1933.

Heavy losses are stated to be caused annually in the Nanking district of China by a dry rot of pomegranate [*Punica granatum*] fruit due to *Zythia versioniana*, first reported from Northern Italy.

In 1931 the disease caused losses of over 30 per cent. of the crop. The pathogenicity of the organism was demonstrated by inoculation and reisolation experiments. Overwintering tests were initiated in December, 1931, when one set of diseased fruits was hung outside the window and another buried in the soil. In April and May, 1932, the pycnosporos of the former set germinated to the extent of 9.3 to 10.5 per cent., while no germination occurred in the latter. The perfect stage previously reported, *Nectriella versioniana* [*R.A.M.*, x, p. 774], was frequently found associated with the pycnidial form, but the genetic connexion between the two stages has not yet been definitely determined.

CORNELL (F. D.). **Recent developments in stationary spray systems in West Virginia.**—*Agric. Engin.*, xiv, 3, pp. 79–80, 1 fig., 1933.

In a further survey of stationary spray systems in West Virginia [*R.A.M.*, viii, p. 658] the author found that the general practice now is to use considerably higher pressures (600 or even 700 lb.) than formerly. Instead of spray guns, three- and four-nozzle rods are now in common use. Another change consists in the use of $\frac{1}{2}$ or $\frac{3}{4}$ in. hose in place of the earlier $\frac{3}{8}$ in., the length of hose being simultaneously reduced from 250 to 150 or 125 ft. by the installation of more laterals. All the new lateral pipes are of $\frac{3}{4}$ to 1 in. capacity.

An attempt was made to compare the costs and efficacy of the stationary and portable spraying systems, a few of the purely provisional data on which from 5 stationary and 10 portable systems are given here while the rest are available on request at the West Virginia Agricultural Experiment Station. The quantities of spray materials used during the three-year period 1930 to 1932 ranged from 3.4 to 8.4 galls. per tree for the stationary and from 2.3 to 11.7 galls (or 7.2 discounting one case of excessive consumption) for the portable equipment. The quantities of materials applied per tree per season for all sprays ranged from 19.8 to 47.8 galls. for the stationary and 12.5 to 43.4 for the portable (nine orchards). Per man-hour the amounts of spray fluctuated between 45 and 166 galls. for the stationary plants, and between 25 and 109 for the portable outfits. The total cost of spraying by the stationary method ranged from 18 to 60 cents per tree per season, the corresponding figures for the portable system being 19 cents to \$1.2 (the latter figure is exceptionally high owing to the use of excessive quantities by one grower).

GOETZ (O.) & WINKELMANN (A.). **Der Schwefelvernebelungsapparat 'Sulfurator'.** [The sulphur vaporization apparatus 'Sulfurator'.]—*Obst- und Gemüsebau*, lxxix, 5, pp. 72–73, 4 figs., 1933.

Highly satisfactory results are reported of the writers' experiments in the control of rose, hydrangea, and chrysanthemum mildews [*Sphaerotheca pannosa*, *Microsphaera polonica*: *R.A.M.*, xii, p. 550, and *Oidium chrysanthemi*] by the large, medium, and small types of sulphur vaporization apparatus [*ibid.*, xii, p. 175].

RIEHM (E.). **Beizgeräte.** [Seed disinfection apparatus.]—*Biol. Reichsanst. für Land- und Forstwirtsch. Flugbl.* 82, 4 pp., 4 figs., 1933.

This is a descriptive list of German cereal seed-grain disinfecting apparatus, under the headings of dusting, liquid, semi-liquid, and hot water treatments. In each case the address of the constructor of the apparatus, as well as the working capacity and the price of the latter, are given, and a few of the types are illustrated.

WILSON (J. D.) & TILFORD (P. E.). **The use of formaldehyde dust in growing seedlings.**—*Ohio Agric. Exper. Stat. Bull.* 520, 40 pp., 5 figs., 1933.

This bulletin gives details of experiments to determine the factors influencing the efficacy of the formaldehyde dust treatment developed by Sayre & Thomas [*R.A.M.*, vii, p. 159] and subsequently used for the control of damping-off of tomato seedlings (*Pythium ultimum* and *Rhizoctonia* [*Corticium*] *solani*) [*ibid.*, xi, p. 409]. The dust was tested against various organisms causing seed-bed diseases of vegetable and flower seedlings, chiefly belonging to the genera *Pythium*, *Rhizoctonia*, and *Fusarium*, listed in the order of their destructiveness. The results showed that mass treatment of the soil with the standard dust (which carries 6 per cent. of formaldehyde) at the rate of $1\frac{1}{2}$ oz. per sq. ft. markedly reduced damping-off of the seedlings in most cases. While most of the seedlings emerged about 24 hours later than in the controls, at the moment of transplantation those growing in treated soil were larger and had more extensive root systems than the controls of the same age, the beneficial effect of the treatment being particularly marked in a number of ornamentals and in beet, cucumber, pea, spinach, and tomato among the vegetables. In a few instances, however, the treatment was injurious to the seedlings, and seeds of campanula, petunia, *Anchusa* [*officinalis*], lettuce, and most of the crucifers, should not be planted until about 24 hours after the soil has been treated. The same also applies to all seed known to be of low germinative vigour. The dust should be worked into the topmost 3 inches of soil, or when used in pots or other containers should be thoroughly mixed with the soil at the rate of 8 to 12 oz. per bushel, depending on the type of soil. With the more formaldehyde-resistant plants good control of seedling diseases was also obtained by introducing the dust in rows together with the seeds at a rate not over 1 oz. of the 6 per cent. dust to each 30 ft. of the row; if dust carrying 4.5 per cent. formaldehyde (which is usually more desirable in row applications, since it flows more freely from the drill and can be more evenly applied) is used, the rate of application may be increased to 1 oz. per $22\frac{1}{2}$ ft. (1 oz. per 30 ft. for plants sensitive to formaldehyde).

Injury to germinating seeds from the treatment was found to occur chiefly at medium soil moisture contents, and was largely eliminated by thoroughly drenching the soil with water immediately after treatment and planting. It was most severe in coarse soils, such as sand, and least severe in those with a high content in organic matter. Drenching the soil with a dilute solution of formaldehyde, while effective, was found to be much more likely

to injure or stunt the seedlings than the dust, and it may also be objectionable because of the physical effect it has on certain soils.

Seedlings should not be transplanted into soil treated with the dust before about 72 hours after the application; the length of this interval is, however, modified to some extent by the temperature, moisture content, and type of the soil used, the formaldehyde escaping more freely from warm, dry soils than from cold, wet ones. The liability to injury also decreases as the organic content and particle fineness of the soil increase.

Much of the injury to plant cuttings which results from attacks of the damping-off organisms was also prevented by treating the sand in the cutting bench at the rate of 3 oz. of the 6 per cent. formaldehyde dust per cu. ft. The sand should be thoroughly stirred at the end of 24 hours after treatment, and the cuttings may be set after 48 hours.

The dust treatment was shown to kill *P. de Baryanum*, *Sclerotium delphinii*, *Fusarium lycopersici* (from tomato), and the mycelium (but not the sclerotia) of *C. solani*, when used in soil containing these fungi.

TASCHER (W. R.). **Experiments on the control of seed-borne diseases by X rays.**—*Journ. Agric. Res.*, xlv, 10, pp. 909-915, 1933.

The results of experiments with cultures of *Fusarium moniliforme* [*Gibberella moniliformis*], *Cephalosporium acremonium*, *G. saubinetii*, and *Diplodia zeae* indicated that these fungi varied in their susceptibility to the action of X-rays from relatively high resistance in the first to high susceptibility in the last-named. *D. zeae*, however, was found to be extremely resistant when present in dormant maize seed, presumably owing to its inactive condition, the presence of resistant spores, and to the absorption of the radiating energy by the seed tissues. The greater resistance of the other three organisms may also be possibly explained by the presence of spores in the pure cultures. Further experiments on the possibility of controlling the diseases of maize caused by *D. zeae* and *G. saubinetii*, bunt (*Tilletia levis*) [*T. foetens*] and loose smut (*Ustilago tritici*) of wheat, and the loose smuts of barley and oats (*U. nuda* and *U. avenae*) by X-raying the seed-grains gave negative results with dormant seed, but the treatment of germinating seeds significantly reduced the percentage incidence of *U. avenae* and completely controlled *U. nuda*; the germination of the seed, however, was very adversely affected by the treatment, and was reduced to as low as 5 per cent. of the controls in barley.

Incidentally it was shown that organic mercury treatment [*R.A.M.*, vii, p. 713] of maize seed partially controlled *D. zeae* but appeared to be ineffective with *G. saubinetii*. There was no evidence of stimulation in any of these treatments.

PAINE (S. G.), LINGGOOD (F. V.), SCHIMMER (FREDA), & THRUPP (T. C.). **The relationship of micro-organisms to the decay of Stone.**—*Phil. Trans. Roy. Soc.*, London, Ser. B, ccxxii, 486, pp. 97-127, 5 pl., 1 fig., 1 graph, 1933.

After giving an account of various bacterial organisms isolated

from decaying stone, a form of decay is described which is characterized by masses of white deposit 1 to 2 mm. below the surface, causing the stone to flake away, so that the deposit remains exposed to the air. The white incrustation is sometimes accompanied by a brown discoloration of the decayed stone.

In a sample of this type of decay the stone was found to harbour a bacterial organism or allied group of organisms capable of oxidizing sulphides and thiosulphates with the formation of sulphuric acid. A search for these bacteria in other examples where decay was accompanied by a crystallization of calcium or sodium sulphates gave positive results for sandstones from numerous buildings, sand which had fallen down a chimney, limestones, a decaying Portland stone, brickwork, and terra-cotta. Although found in a great majority of the cases, these bacteria are not considered as invariably responsible for the formation of the sulphates, which can adequately be explained in certain circumstances on chemical and physical grounds.

The organism grew well on plates of washed agar containing mineral salts, including sodium thiosulphate and precipitated chalk. At 28° C. the colonies appeared in about two weeks, the surface colonies being round and the deep ones spindle-shaped. They gradually became surrounded by a clear halo in which the chalk was dissolved by the sulphuric acid produced, while they also showed a dense, cyst-like, yellowish-brown centre surrounded by a clear, wide envelope of mucilage. The yellow colour of the central zone was found to be due to sulphur granules, while both the outer and inner regions contained masses of minute cocci, 0.28 μ in diameter. It is believed that this organism is commonly present in dust.

Inoculations demonstrated that the bacteria caused a loss of weight in stone, with the removal of calcium sulphate. In one experiment a column of Bath stone 4 in. long by 1 in. square section, was inoculated and fed with a solution containing 2.5 gm. thiosulphate per litre, uninoculated controls receiving the same treatment. The solution was allowed to drip on to a muslin cap and after passing over the surface of the column, was collected and the sulphate determined. At the end of the experiment the columns were allowed to dry, when a blister consisting of a thin, brown skin was found to have formed along the line of flow on the inoculated stone. When the skin was removed it was observed that some of the oölites at the surface of the stone had been carried away with it, some having actually split in the process. The skin was composed of the mucilage of the bacterial zooglaeae which had developed on the surface. The tearing of the surface indicates a possible way in which the sulphur-oxidizing bacteria may disintegrate stone, quite apart from the solvent action of the sulphuric acid excreted.

There is a bibliography of 28 titles.

COTTAM (C.). **Disappearance of Eel Grass along the Atlantic coast.**—*Plant Disease Reporter*, xvii, 6, pp. 46-53, 1933. [Mimeographed.]

In 1931-2, following almost unprecedented drought, low tides,

and calm weather, large areas of grass-wrack seaweed or 'eel grass' (*Zostera marina*) rapidly disappeared from numerous localities along the Atlantic seaboard of North America. In most of the areas affected the leaves, during the midsummer of 1931, became dark, broke from their roots and floated ashore in masses. The disappearance of the eel grass was observed from New Jersey to Maine before it became apparent north or south of this stretch of coast; part of the Maine coast appears to have been affected at least as early as 1930. There now exists an unprecedented scarcity of living eel grass on the coast of Nova Scotia, Prince Edward Island, and along all but the extreme north of the coast of New Brunswick. As the disease has been active for two years in the Bay of Fundy, it is not unlikely to spread to the northern part of the Gulf of St. Lawrence.

The virulence of the attack varies considerably in different localities. Badly affected plants appear as if wilting and disintegrating. The attacks generally begin as one or more greyish-brown spots on a leaf margin [*R.A.M.*, xii, p. 308], the outermost leaves and sheaths usually being affected first. The leaf turns brown and dies, death and disintegration commonly progressing from tip to base. The affected part frequently extends for a considerable distance down one margin or a large vein before spreading across the leaf. The brownish, later blackish, areas are especially noticeable on the rhizomes, which readily become black, fragile, and spongy, and soon break apart at the nodes. Occasionally, the disease appears to have progressed upwards from a diseased rootstalk, in which case the outer portions of the plant are affected first.

Though bacteria were present in some of the diseased tissues [loc. cit.] no evidence was obtained that they were the cause of the condition.

ELFORD (W. J.). **The principles of ultrafiltration as applied in biological studies.**—*Proc. Roy. Soc.*, London, Ser. B., cxii, 778, pp. 384–406, 1 pl., 1 fig., 7 graphs, 1933.

Using a series of graded collodion membranes termed 'gradocol' the author studied the effect of various factors on the filtration of suspensions of fine particles and colloids. Filtration through these membranes begins to be impeded at a pore size two to three times greater than that which absolutely prevents passage. It had already been determined that a pore size less than $0.75\ \mu$ effectively retains *Bacillus prodigiosus* (0.5 to $1\ \mu$ in diameter) suspended in broth at P_H 7.6, and further work showed that the limit of permeability varied with the concentration of the suspension. With dye solutions over a tenfold variation in initial concentration the relationship was one of slightly less than inverse proportionality. With membrane pores of less than $1\ \mu$ in diameter the particle/pore-size ratio decreases, until for a $10\ \mu\mu$ pore particles of half this size are retained.

Increase in the membrane thickness or area increases the adsorbing surface proportionally. Under otherwise comparable conditions the adsorption in filtration is proportional to the membrane thickness and surface area. At low pressures the apparent

adsorption is rather more than directly proportional to the membrane thickness.

Where the initial adsorption stage is of negligible proportions, increasing the filtration pressure merely increases the rate of filtration. Where the effects of surface forces are appreciable the influence of pressure may be very marked in the early stages of filtration.

To determine the end-point in membrane permeability for a given suspension it is necessary to establish the percentage-concentration/volume of filtrate curves for membranes of progressively lower porosities under standard conditions. It is then possible to ascertain the point at which surface forces of adsorption and cohesion begin to exert an abnormal influence upon the course of filtration. This indicates that the end-point is being approached, and coincides with a rapid decline in the rate of filtration, owing to the membrane becoming choked. The filtration curves from this point onwards require to be very carefully studied, selecting conditions most favourable to filtration until the value of the true filtration end-point is found. The sharpness with which the end-point is defined depends upon the regularity of membrane structure and the uniformity of dispersion in the system being filtered.

As the determining factors in filtration cannot be accurately assessed independently, it is only possible to express the probable limits for the size of the smallest particle just retained by a given membrane, as obtained under the best available conditions for filtration. This has been worked out for several animal viruses, oxyhaemoglobin, egg albumin, and gold sol. The limits thus obtained are compared with those determined microscopically and by other methods, and show a fair measure of agreement. Thus the size of the virus of infectious ectromelia from filtration data was 0.10 to 0.15 μ , subsequent measurements of photographs of the bodies giving 0.13 to 0.14 μ . The probable size of the elementary virus units of vaccinia virus was found to be 0.125 to 0.175 μ by filtration, the maximum size as measured by means of ultra-violet light photography being 0.17 to 0.18 μ .

SMITH (K. M.). **The present status of plant virus research.**—*Biol. Reviews*, viii, 2, pp. 136–179, 1 pl., 1933.

This paper gives a brief general survey of work in the study of plant virus diseases mostly during the last 20 years and, taken in conjunction with the author's previous review [*R.A.M.*, x, p. 808], its object is to help to relate to one another some of the many apparently contradictory facts in the extensive relevant literature [some 300 titles are cited in the bibliography appended], and thus reveal any new principles at present obscured by a redundancy of facts. The chief methods of approach to this study are discussed under the following headings. (A) Physical properties of the viruses, namely, their reaction to heat, chemicals, dilution, purification, filtration, adsorption, ageing *in vitro*, and light. (B) Symptomatology, including the histology of the healthy and diseased plants. (C) Various methods of transmission. (D) Attempted cultivation *in vitro* of a plant virus, and of some supposed causal organisms of virus diseases. (E) Movement of the

virus within the host plant. (F) Metabolism of the virus-affected plants. (G) Photography of the viruses by ultra-violet light. (H) Some other aspects of the behaviour of virus-affected plants. (I) Electric charge of virus particles.

In the next two chapters the author discusses the application of some of the above-mentioned methods to the differentiation of the various viruses, and points out that much of the confusion now existing in this subject is due to the fact that most of the authors have attempted to name the disease instead of the virus and have not made a sufficiently clear distinction between the disease and its causative principle; some of the more recent work on the potato mosaic group is then discussed in detail. In a reply to Murphy's criticisms of his work on the *x* and *y* viruses [*ibid.*, xi, p. 738] he states that they appear to be partly based on a misapprehension of the use of the words 'streak', 'crinkle', and 'mosaic', which were used by him to designate each a set of symptoms, while Murphy uses them to designate a specific virus. While agreeing with the latter that, besides these two potato viruses, there also exists another—virus A [*ibid.*, xi, p. 740], and also an independent virus occurring as Up-to-Date streak, he considers that the variations noticed in the symptoms produced by the *x* virus on tobacco [nineteen types of which are illustrated in the plate appended] would suggest that they are due to the existence of variants of a single virus, which probably are not constant mutations. The position thus seems to be that there are at least five, and possibly more, distinct potato mosaic viruses, namely the author's *x* and *y*, the A virus of Murphy & M'Kay, Salaman's paracrinkle, and the Up-to-Date streak virus. As regards the insect vectors of these viruses, so far the virus *y* alone has been definitely shown to be efficiently transmitted by the aphid *Myzus persicae*, and there is no clear evidence of the method of transmission in nature of the others.

DUGGAR (B. M.). **Standardization and relative purification technique with plant virus preparations.**—*Proc. Soc. Exper. Biol. & Med.*, xxx, 8, pp. 1104–1109, 1933.

A description is given of the writer's tentative standard method for the relative purification of the tobacco mosaic virus [*R.A.M.*, vii, p. 525].

The crude juice from diseased plants is obtained by grinding the leaves and young stems in a food mill and expressing the juice through a double thickness of cheesecloth. This full-strength juice may be diluted with 9 parts of distilled water, to which is added with stirring 10 gm. of celite (a special product of the nature of diatomaceous earth; the finer commercial grades of the latter may also be used) per 100 c.c. of diluted juice. After 30 minutes' standing, with frequent shaking, the preparation is centrifuged at about 4,000 revolutions per minute for four to five minutes. The celite treatment has no marked influence on the activity of the tobacco mosaic virus, the infectiousness of the filtered celite-treated juice being little less than that of the unfiltered controls and averaging 90 to 100 per cent. at a dilution of 1 in 1,000. It was shown by a test with a 12 cm. Mandler filter

candle that the viscous materials in the natural juice markedly impeded the passage of the virus particles across the walls of the filter.

WOLFF (H.). **Zur Assimilation atmosphärischen Stickstoffs durch die Wurzelpilze von *Corallorrhiza innata* R. Br., sowie der Epiphyten *Cattleya bowringiana* Veit und *Laelia anceps* Ldl.** [On the assimilation of atmospheric nitrogen by the root fungi of *Corallorrhiza innata* R. Br., and by those of the epiphytes *Cattleya bowringiana* Veit and *Laelia anceps* Ldl.]—*Jahrb. Wissensch. Bot.*, lxxvii, 5, pp. 657-684, 1933.

The author succeeded in isolating the endophyte of *Corallorrhiza innata* and also grew those of *Cattleya bowringiana* and *Laelia anceps*. The first of these resembled the endophyte of *Neottia* (*Orcheomyces neottiae*) [*R.A.M.*, vi, p. 744] and the others were as described by Burgeff [*Rhizoctonia repens*: *ibid.*, v, p. 177; xii, p. 583].

In pure culture the endophyte of *Corallorrhiza innata* utilized glucosides (e.g., tannin) and hexoses (glucose). The assimilation of elementary nitrogen from the air was quantitatively determined and found to amount to 0.24 to 0.84 mg. in 100 c.c. nutrient solution per 100 days of culture and about 35 to 190 mg. dry weight. The endophytes of *Cattleya bowringiana* and *L. anceps* utilized glucosides (tannin), hexoses (glucose, mannose, salep solution), and pentoses (arabinose). Atmospheric nitrogen was also fixed by these organisms at the rate of 0.23 to 0.96 mg. in 100 c.c. nutrient solution per 100 days and 40 to 120 mg. dry weight. By means of its hyphae the endophyte of *Corallorrhiza innata* is enabled to assimilate the carbohydrates in the soil and to supply them, together with nitrogen, to its host, which is practically devoid both of chlorophyll and of roots.

SCHAEDE (R.). **Über die Symbionten in den Knöllchen der Erle und des Sanddornes und die cytologischen Verhältnisse in ihnen.** [On the symbionts in the nodules of the Alder and of the Sea Buckthorn and their cytological relations.]—*Planta*, xix, 2, pp. 389-416, 19 figs., 1933.

A detailed account is given of the writer's studies on the cytology of the endophytic Actinomycetes associated with the root nodules of alder (*Alnus japonica* and *A. glutinosa*) [*R.A.M.*, xii, p. 312] and sea buckthorn (*Hippophaë rhamnoides*), the two former growing in the Breslau Botanic Gardens and the latter being sent from the island of Rügen.

At a certain stage in the development of the *Actinomyces* (that of *H. rhamnoides* closely resembles that of the alders), they are completely absorbed by the hosts so that only the membranes are left. The nuclei of the infected cells first increase and then decline in size. Gradually the infected cells die off and their plasmatic content is absorbed by the adjacent cells.

The 'bacteroids' accompanying *Actinomyces* sp. in the nodules of *A. glutinosa* are considered to represent a stage in the development of the former and to originate from the disintegration of the filaments into small clumps. The cells in which the bacteroids

occur are dead and contain neither cytoplasm nor nuclei. At this stage the symbiotic relationship between the endophyte and its host is lost, the former ceasing to develop in the shape of hyphae and vesicles and the latter being unable to digest the assimilatory products of the symbiont.

MITTMANN (GERTRUD). **Kulturversuche mit Einsporstämmen und zytologische Untersuchungen in der Gattung *Ceratostomella*.** [Culture experiments with monospore strains and cytological investigations on the genus *Ceratostomella*.]—*Jahrb. Wissensch. Bot.*, lxxvii, 2, pp. 185–219, 45 figs., 1932.

A comprehensive account is given of the writer's cultural and cytological studies, conducted at the Tübingen Botanical Institute, on *Ceratostomella jimbricata*, *C. coerulea*, and *C. quercus* Georgevitch [*R.A.M.*, vii, p. 286], the first two from the Centraalbureau voor Schimmelcultures, Baarn, and the third from a Suabian oak wood, the trees of which have been severely affected during the last 20 to 30 years by canker-like blisters and wounds. *C. jimbricata* and *C. quercus* were shown to be homothallic and *C. coerulea* heterothallic [cf. *ibid.*, viii, p. 227].

HOMMA (YASU). **Homothallism in *Sphaerotheca fuliginea* (Schlecht.) Pollacci.**—*Proc. Imper. Acad.*, Tokyo, ix, 4, pp. 186–187, 1 fig., 1933.

In order to verify the conclusions of Harper (1905) and Dangeard (1907) regarding homothallism in *Sphaerotheca fuliginea* [*S. humuli* var. *fuliginea*: *R.A.M.*, x, p. 500], the writer carried out a series of inoculation experiments at the Hokkaido University, Sapporo, with single conidia of this organism on *Taraxacum ceratophorum* plants grown in pots and covered with glass. Four plants out of the 23 inoculated contracted infection and perithecia developed on the mycelial plaques. A cytological examination showed that both the ascogonial and antheridial hyphae are formed on the single mycelium derived from the monosporic infection.

HÜTTIG (W.). **Über physikalische und chemische Beeinflussungen des Zeitpunktes der Chromosomenreduktion bei Brandpilzen.** [On the physical and chemical factors influencing the moment of chromosome reduction in the smut fungi.]—*Zeitschr. für Bot.*, xxvi, 1, pp. 1–26, 2 figs., 7 graphs, 1933.

Two methods of fusion occur between the promycelial cells in *Ustilago avenae* from oats and *U. decipiens* from *Arrhenatherum elatius* according to whether the reduction division takes place in the first or second division of the promycelium [cf. *R.A.M.*, xii, p. 17]. By observing the proportion of these methods in germinating spores under experimental conditions, the effect of various factors on the moment of the reduction division was ascertained.

No influence was exerted by modifications in the vapour tension, osmotic pressure, or hydrogen-ion concentration of the medium. The optimum temperature for the development of the promycelium in *U. avenae* lies between 22° and 25° C. and for *U. decipiens* round about 20°, the greatest number of cases in which the reduction occurs in the first division being at 13° for *U. decipiens*.

and at 25° for *U. avenae*. The urethanes impeded or suppressed reduction in the first division, while various other alkali salts stimulated the process in a more or less irregular fashion, the sodium salts being exceptional in that they exerted a fairly constant inhibitory action at all the concentrations tested.

DIX (W.) & RAUTERBERG (E.). **Die Sterilisation des Bodens mit Hilfe des elektrischen Stromes.** [The sterilization of the soil with the aid of the electric current.]—*Arch. für Pflanzenbau*, A, x, 2, pp. 172–190, 1 fig., 1933.

In connexion with an investigation at Kiel, Germany, on the possibilities of soil sterilization by electricity [cf. *R.A.M.*, xi, p. 589], the writers found that the potato wart fungus [*Synchytrium endobioticum*] withstood a current of 2,750 volts and 3.5 amperes. The fungus can be completely destroyed by five minutes' heating of the soil to between 90° and 100° C., and electrical methods for this (which are, however, too costly for present use) are fully discussed from the technical and economic standpoints.

EICHINGER. **Kartoffelschorf und Düngung. III.** [Potato scab and fertilizing. III.]—*Superphosphat*, ix, p. 2, 1933. [Abs. in *Fortschr. der Landw.*, viii, 13, p. 308, 1933.]

Continuing his observations on the incidence of potato scab [*Actinomyces scabies*] in relation to various systems of fertilizing in Germany [*R.A.M.*, xi, p. 597], the writer found in 1932 that the disease may be checked by the application of potassium bisulphate-magnesia, superphosphate, and ammonium sulphate. Top dressings of lime exerted no injurious effect.

Potato scab and Rhizoctonia and their control.—*Amer. Potato Journ.*, x, 4, pp. 65–73, 1933.

W. P. Raleigh and R. Bonde report an average increase in the potato yields of 17 barrels per acre as a result of seed treatment in 1932 against *Rhizoctonia* [*Corticium*] *solani* on Aroostook Farm, Maine [see above, p. 613]. The best results were given by three minutes' immersion in mercuric chloride, with or without the addition of 1 per cent. hydrochloric acid [*R.A.M.*, xii, p. 530]. Irish Cobblers grown on the farm for five seasons and selected for freedom from *C. solani* showed only a trace of infection even without treatment.

R. W. Goss states that the only reliable means of controlling scab [*Actinomyces scabies*] in Nebraska is the hot formaldehyde treatment, which is not, however, so effective against *C. solani* as mercuric chloride. Consequently it is advisable to use the former treatment in the western part of the State, where scab is very important, and the latter (or improved semesan bel) in the eastern and south-central regions, where *C. solani* is prevalent and often followed by blackleg [*Bacillus phytophthorus*].

The following results were given by disinfection experiments by C. F. Taylor and L. L. Stirland of Cornell during the past four years. The average yield increases for mercuric chloride, yellow oxide of mercury, and calomel have been 10.3, 11.3, and 9.7 bushels per acre, respectively. The inorganic mercury compounds have

given the greatest reduction in the percentage of tubers bearing sclerotia of *C. solani*. When the plants were a few inches high, there was an average of 39 out of 100 fewer rotted seed pieces on the yellow oxide-treated plot than on the untreated, the corresponding figures for mercuric chloride and calomel being 12 and 14, respectively. During the past two years the following increases of scab followed the use of mercurial compounds in the high limestone regions of New York State where this disease is serious: hot mercuric chloride 8 per cent., yellow oxide 8.3, semesan 1.5, and cold mercuric chloride 1.2. The increase in the disease occurred whether the mercury was added to the fertilizer or used as a tuber dip. Cold and hot formalin reduced the incidence of scab by 9.1 and 3.8 per cent., respectively, compared with the untreated. It is evident from these data that formaldehyde is preferable to the mercury disinfectants where soil-borne scab is an important factor, but in acid soils yellow oxide of mercury (1 lb. per 15 galls. water) or hot mercuric chloride may be recommended.

A. scabies is believed by P. E. Tilford to occur naturally in certain parts of Ohio, having infested a potato crop planted on land put into cultivation for the first time after forty years.

B. J. Dippenaar found that, under Wisconsin conditions, the application of sulphur to the soil at the rate of 300 to 900 lb. per acre is effective against scab when combined with liberal irrigation of the soil. In a naturally infested peat soil, the average number of lesions per tuber in a plot where the moisture was kept at 85 per cent. of the water-holding capacity was only 7.5 as compared with 62 at 40 per cent. [*ibid.*, xii, p. 389]. In general, very little scab occurs in soils with a reaction of P_H 5.3 or lower, whereas above 5.5 the disease may be severe [*cf. ibid.*, xii, p. 189]. In greenhouse tests it was found possible to control scab by changing the soil reaction from P_H 5.8 to 5.17 by sulphur applications before the setting of the tubers.

R. E. Vaughan recommends the acid mercury dip for the control of scab and *C. solani* in Wisconsin. In 1932 this treatment gave 82 and 97 per cent. freedom from *C. solani* in the five- and ten-minute dips, respectively, the corresponding figures for mercuric chloride (1½ hours), cold formaldehyde, and untreated being 52, 36, and 16 per cent., respectively. The incidence of severe infection by *C. solani* was only 1 per cent. for the ten-minute acid mercury dip as compared with 34 and 36 per cent., respectively, for cold formaldehyde and untreated. Hot formaldehyde gives good control of both diseases but causes a heavy reduction of germination.

MEYER-HERMANN (K.). **Beobachtungen und Untersuchungen über die Eisenfleckigkeit der Kartoffel.** [Observations and studies on Potato spraing.]—*Fortschr. der Landw.*, viii, 9, pp. 200-205, 1 fig., 1933.

The writer summarizes his observations on spraing of potatoes in the Cassel district of Germany, and discusses the problem of the increasing prevalence of this disease in the light of contemporary studies [*R.A.M.*, xii, p. 391].

It is evident that soil conditions play an important part in the development of spraing, but the nature of their influence has been

variously interpreted. Appel, in his 'Taschenatlas der Kartoffelkrankheiten' (I Teil: Knollenkrankheiten), Berlin, P. Parey, 1925, states that the disease occurs mostly on heavy, ferruginous soils, sometimes also on those with a tendency to incrustation. In Hungary J. Tabacs (*Növényvéd.*, vi, p. 155, 1930) also found spraing on compact soils. E. Riehm and M. Schwartz (*Mitt. Deutsch. Landw.-Gesellsch.*, p. 157, 1927) attribute it to soil acidity and lime deficiency, whereas Schlumberger regards the disease to some extent as a consequence of alternating drought and moisture on light soils (*Die Kartoffel*, xi, p. 229, 1931). Atanasoff's observations in Holland are also summarized [*R.A.M.*, vi, p. 179]. The author found the disease exclusively on light sandy soils, rich in humus, among over 100 samples of all types examined, and notes its absence from swampy soils and from those consisting of a clay-sand mixture. No correlation could be detected between the soil reaction and the disease, which has been most prevalent in wet years such as 1930 and 1931. The nature and amount of the fertilizers applied to the potato fields appear to be of minor importance. Spraing occurred on a gravelly, red, ferruginous soil brought into cultivation for the first time in 1931, so that the disease is evidently not dependent on a preceding crop.

In the districts under the author's observation, Direktor Johanssen and Erdgold potatoes are so severely affected that their cultivation is scarcely practicable, the following varieties being involved in a decreasing extent as named: Sickingen, Kaiserkrone, Deodara, Parnassia, Rosafolia, Maibutter, and Ackersegen, while Preussen is apparently immune. Large tubers tend to show more spraing than small ones, while late harvesting also appears to increase its incidence. No evidence of seed transmission was obtained.

Under the terms of the German potato trade regulations (1930), seed potatoes cannot be rejected on account of spraing except by special arrangement, but such material is frequently difficult to dispose of and fetches a low price. In Switzerland (*Die Kartoffel*, p. 174, 1932) the purchaser is entitled to a rebate on consignments with more than 20 per cent. of spraing unless he has expressly agreed to accept them in this condition, while those affected to the extent of over half (by weight) may be rejected.

MÜLLER (K.). **Einiges über Kartoffelkrankheiten.** [Notes on Potato diseases.]—*Die kranke Pflanze*, x, 4, pp. 56-57, 1 fig., 1933.

A brief, popular note is given on the reduction of the German potato harvest in 1932 through scab [*Actinomyces scabies*], late blight (*Phytophthora infestans*), and spraing [see preceding abstract], the last-named being particularly severe on the Erdgold and other new varieties, many consignments of which were rejected on account of the disease.

BLODGETT (F. M.), MADER (E. O.), BURKE (O. D.), & McCORMACK (R. B.). **New developments in Potato spraying.**—*Amer. Potato Journ.*, x, 5, pp. 79-88, 3 graphs, 1933.

This is an extended and tabulated account of the writers' four

years' spraying experiments [against *Phytophthora infestans* and other diseases and pests] on Rural potatoes in New York State and on Green Mountains in Long Island [*R.A.M.*, xii, p. 390]. In New York the best results were obtained by Bordeaux mixture at the rate of 75 to 80 lb. copper sulphate per acre applied at 400 lb. pressure, the amount required on Long Island apparently being somewhat less. The yields improved with a decrease in the amount of lime in the Bordeaux mixture, the ratio recommended being 5 lb. copper sulphate and $2\frac{1}{2}$ lb. lime per 50 galls. water.

MOORE (H. C.) & WHEELER (E. J.). **Spraying and dusting Potatoes in Michigan.**—*Michigan Agric. Exper. Stat. Special Bull.* 234, 23 pp., 11 figs., 1933.

In tests carried out during 1927-8 spraying potatoes with Bordeaux mixture against early and late blight [*Alternaria solani* and *Phytophthora infestans*] and insect pests resulted in an average increase of yield on 22 farms of 38 bushels of U.S. No. 1 tubers per acre [*R.A.M.*, xii, p. 240]. In six years' experiments Bordeaux-sprayed plots out-yielded those dusted with copper-lime by 13.7 bushels per acre for Russet Rurals and 20.86 for Irish Cobbblers. Home-mixed dust was cheaper by \$1.41 per acre than factory preparations and equally effective in five years' trials. No significant differences in yield were obtained in eight comparative experiments with hand, traction, and power dusting outfits. At the Lake City potato experiment farm, dust applications of 30 lb. per acre gave better results than lighter ones. Hydrated lime proved equally efficacious with quicklime in the preparation of Bordeaux mixture; it is recommended for Michigan growers as being readily procurable and both quick and easy in handling. 'Instant' and standard Bordeaux gave comparable results, but the former saves time and labour, since stock solutions are unnecessary. In two years' trials 300 lb. pressure was more effective than 150 or 450 lb. Spraying with Bordeaux was cheaper than dusting with copper-lime by \$3.70 per acre. At least five and preferably seven or more applications should be made at seven- to ten-day intervals throughout the growing season, beginning when the plants are about 4 in. high.

BROWN (B. E.), HOUGHLAND (G. V. C.), SMITH (O.), & CAROLUS (R. L.). **The influence of magnesium on different Potato soil types.**—*Amer. Potato Journ.*, x, 4, pp. 55-65, 1 map, 1933.

Potatoes in Maine, New York, New Jersey, Virginia, and elsewhere are liable to be affected by a well-defined disturbance of growth associated with chlorosis of the leaves (especially the lowest), which in severe cases turn brown, thicken, harden, and finally die. The discoloration starts at the leaf margin and gradually involves the entire surface.

In most cases the diseased plants were found to be growing on very acid soils (P_H 4.2 to 5), the reaction being further accentuated by the use of ammoniacal nitrogen; under such conditions the leaching of basic compounds, such as lime and magnesium, might

reasonably be expected. Field studies in Aroostook County, Maine, confirmed this supposition, and on Norfolk sandy loam soil in Virginia highly beneficial results followed the addition of magnesium sulphate when the soil reaction was P_H 4.2 though not at 5.5.

It is pointed out that the amount of magnesium in the water sources of the coastal plains sections of the Atlantic seaboard is much lower than elsewhere in the United States [cf. *R.A.M.*, xi, p. 470].

TULLIS (E. C.). ***Ophiobolus oryzinus*, the cause of a Rice disease in Arkansas.**—*Journ. Agric. Res.*, xlv, 9, pp. 799–806, 1 fig., 1933.

This is the full report of the author's investigation of *Ophiobolus oryzinus* on rice in Arkansas, an abstract from which has already been noticed [*R.A.M.*, xi, p. 469]. The disease rots the lower leaf sheaths, on the inner surface of which dark reddish-brown mycelial mats may be found, while perithecia develop in the discoloured tissues. The culms are also invaded but do not bear perithecia in the field. In some varieties the tissues at the crown may also be killed. Cultures are readily obtained, and the fungus was found to be homothallic. In young leaves penetration occurs without the formation of appressoria, but in older ones and the culm appressoria are first developed.

MURRAY (R. K. S.). **Further yield records in connection with *Oidium heveae*.**—*First Quart. Circ. för 1933, Rubber Res. Scheme (Ceylon)*, x, 1, pp. 1–8, 2 graphs, 1933.

This report summarizes the results obtained in 1932 in the continued sulphur dusting experiments for the control of mildew of *Hevea* rubber (*Oidium heveae*) on the Kandanuware Estate, Ceylon [*R.A.M.*, xi, pp. 126, 401]. Owing to a mechanical breakdown of the apparatus, the dusted field could not be satisfactorily treated between 20th January and 2nd March, with the result that, despite applications of sulphur before and after this period, the condition of the dusted trees during the season was very little superior to that of the controls, the intensity of the disease being as great in 1932 as in previous years. In spite of the latter fact, the yield of the individual trees per tapping in the control field increased from 0.31 oz. in 1931 to 0.35 oz., indicating that the conditions of 1932 were relatively favourable for yield. On the other hand, in the dusted field the yield per tapping fell slightly from 0.51 to 0.49 oz., presumably owing to the partial failure of the dusting operations, entailing a slower normal recovery in yield of the treated trees after wintering. The fact that, notwithstanding the adverse conditions, the yield per acre was still higher in the dusted field than in the control, a reversal of the position in years prior to the adoption of control measures, is considered to show that although sulphur dusting cannot be neglected in any one year without detriment to the trees, the benefits to the general health of the latter conferred by previous years' treatments are to some extent cumulative.

MA (ROBERTA M.). **A study on the soil fungi of the Peking district.**—*Lingnan Sci. Journ.*, xii (Supplement), pp. 115–118, 1933.

During the year 1931–2 the writer analysed the fungus flora of soil samples from rice, wheat, and millet fields, grass lands, and garden and hillside soils in Peiping West (Peking district).

Sixty-six species of fungi in 23 genera were determined, *Aspergillus* and *Penicillium* predominating, as in western countries, both in numbers (17 and 15 species, respectively), and in frequency of occurrence throughout the year. *Rhizopus nigricans*, *Trichoderma album*, *T. koningi*, *T. lignorum*, *Gliocladium fimbriatum*, and *G. penicilloides* were found in rice and wheat fields and garden soils, and *Hormodendrum cladosporioides* [*R.A.M.*, xi, p. 375], *H. olivaceum*, and *H. pallidum*, *Alternaria humicola* [*ibid.*, vii, p. 471], *Fusarium* spp. (including *F. lini*), *Acrothecium robustum*, *Acrostalagmus* spp., and *Amblyosporium echinulatum* in various garden soils, millet fields, and grass lands. Other fungi were more or less restricted to certain fields at definite times of the year.

Gulspidssyge. [Yellow tip disease.]—*Statens Forsøgsvirksomhed i Plantekultur, Medd.* 144, 4 pp., 2 figs., 1933.

A brief, popular note is given on the occurrence in Denmark (almost exclusively in Jutland) of the 'yellow tip' [reclamation] disease of oats, barley, red clover [*Trifolium pratense*], lucerne, field peas [*Pisum arvense*], broad beans [*Vicia faba*], and swedes, and on its control by the application to the soil in spring of 50 kg. copper sulphate per hect. [*R.A.M.*, xi, p. 767]. The beneficial effects of this treatment last for three to four years. The copper sulphate may be mixed with ammonium sulphate, potash, potassium sulphate, or sand to facilitate application. The use of lime tends to promote the reclamation disease and should be discontinued in the affected areas, where an admixture of clay or marl with the soil is advisable. Grey and bog oats are more resistant than the white varieties and spring rye may also safely be cultivated.

CHUPP (C.). **Downy mildew of Hops in New York.**—*Plant Disease Reporter*, xvii, 8, pp. 103–104, 1933. [Mimeographed.]

A survey made in June 1933 of the few hop gardens now existent in New York State showed that in all *Pseudoperonospora humuli* [*R.A.M.*, xii, p. 325] was sparsely present on the lowest leaves of plants a year or more old, though no damage had been done except in one garden. Infection was most marked where the small shoots had been carelessly removed from the crowns. A few plants were found with symptoms resembling mosaic.

BRESSMAN (E. N.) & NICHOLS (R. A.). **Germination of the oospores of *Pseudoperonospora humuli*.**—*Phytopath.*, xxiii, 5, pp. 485–487, 1933.

Using the method devised by Hiura for the germination of the oospores of *Sclerospora graminicola* [*R.A.M.*, ix, p. 774], the writers obtained prompt germination of the oospores of downy mildew of hops (*Pseudoperonospora humuli*) from leaves collected two years

previously and kept dry in the laboratory at Corvallis, Oregon [ibid., ix, p. 59].

Germinated oospores had formed sporangia and emitted zoospores in less than 36 hours from sowing and six young Late Cluster seedlings inoculated in the greenhouse with these zoospores on 28th December, 1932, showed unmistakable evidence of mildew on 2nd January, 1933. On 1st January incipient zoospore formation was also found on similar leaf material that had been soaking in water for several days. Eight Fuggles seedlings were inoculated with these zoospores on the same day, and by 4th January all were heavily infected.

The germ-tube, about twice the diameter of the oospore in length, developed at its tip a sporangium similar to the summer ones, and containing more than 30 zoospores. The oospores measured approximately 30μ in diameter, the sporangia 26 by 31μ , and the bean-shaped zoospores 5 to 7μ .

RUNNELS (H. A.) & WILSON (J. D.). **Control of the Alternaria blight of Ginseng with Bordeaux mixture and injuries accompanying its use.**—*Ohio Agric. Exper. Stat. Bull.* 522, 16 pp., 4 figs., 1933.

This bulletin embodies the results of continued experiments on the control of the blight due to *Alternaria panax* on ginseng (*Panax quinquefolium*), which confirmed those discussed in previous communications [*R.A.M.*, x, pp. 58, 807]. They also showed that besides intensifying the drought injury to the plants, as previously described, improperly prepared Bordeaux mixture causes a serious leaf burn, and when applied in cold weather may cause an injury in which the wet tissues of young leaves are frozen, resulting in leaf killing or, if the injury is not so severe, in the deformation of later growth, involving the shredding of the leaf margins.

Soil moisture determinations in 1931 indicated that the critical soil moisture content at which drought injury became apparent on the leaves of sprayed plants ranged from 12 to 17.5 per cent. of the dry weight of the soil. In 1932 it was found that when plants just beginning to wilt from drought were sprayed with Bordeaux mixture, death of the leaves from drying out followed within 24 hours. This renders it advisable on non-irrigated soils to postpone spraying ginseng during drought periods until after the occurrence of a rain sufficiently heavy thoroughly to drench the soil.

COOK (M. T.). **Report on the international survey of the diseases of Sugar Cane.**—*Fourth Congress Internat. Soc. Sugar Cane Technologists, 1932, Bull.* 128, 15 pp, 1932. [Received July, 1933.]

From data furnished by a number of leading plant pathologists the writer has compiled a report on an international survey of sugar-cane diseases under the following aspects: historical; economic importance; transmission; environmental studies; varietal reaction; geographical distribution [cf. *R.A.M.*, viii, p. 809]; and problems suggested by the survey. A summary of the replies concerning most of the diseases listed is given and contains many

interesting notes on the identity, distribution, and spread of the pathogens.

McCLEAN (A. P. D.). **Streak disease of Sugar Cane.**—*South African Sugar Journ.*, xvii, 5, pp. 247, 249, 251, 253, 255, 257, 259, 1933.

In this paper (read before the South African Sugar Technologists' Annual Congress) the present position concerning streak disease of sugar-cane in Natal [*R.A.M.*, xi, p. 603], is described.

A streak survey is in progress to determine the exact extent of infection in the various districts of Natal, and preliminary figures in respect of the south coast are already available. In Port Shepstone, where 13 fields covering 800 acres were inspected, the incidence of streak ranged from 75 to 100 per cent., the corresponding acreages and disease percentages for five other districts being as follows: Umzumbi 70, 99, Hibberdene 360, 11 to 55, Umtwalumi 1120, 20 to 50, Sezela 470, 66 to 90, and Esperanza 600, 3 to 83. In the first-named district streak was found to be as prevalent in the plant cane as in the ratoons, and no steps are taken to procure healthy material for planting. Further north the position improves and genuine efforts are made to control the primary spread of the disease. But in the Umbogintwini and along the Isipingo and Reunion flats the amount of infection in individual fields ranges from 20 to 100 per cent., at Stanger it is from 50 to 100 per cent., and in Zululand there are considerable areas where it is difficult to find any healthy plants. Where only healthy cane is used for planting the infection is much less. Thus, at Mount Edgecombe the percentages of streak in plant (521 acres) and ratoon (979) cane were 8 and 9, respectively, and at Tongaat (675 acres of plant and 749 of ratoon) 9.5 and 12.5, respectively.

At Mount Edgecombe a streak test has been proceeding for the last four years, four plots of 100 per cent. infected cane having been laid out alternating with four of cane raised from healthy seed. After two years 55 per cent. of the plants in the healthy plots showed infection and after four years 70 per cent.

In 1932 streak developed for the first time in the Co. 290 variety which, with P.O.J. 213, was hitherto believed to be immune. In Co. 290 the infection is apparently permanent, whereas in P.O.J. 213 attacks of the disease may be followed by partial or complete recovery. In the spring of 1933 five cases of streak were observed among P.O.J. 2725 in Zululand, a week or two after the receipt of a report from A. H. Rosenfeld of the occurrence of the disease on P.O.J. 2878, 2725, and 2714 in Egypt.

The paper was followed by a discussion.

McCLEAN (A. P. D.). **The behaviour of the Cane variety P.O.J. 213 towards streak disease.**—*Fourth Congress Internat. Soc. Sugar Cane Technologists, 1932, Puerto Rico, Bull.* 27, 6 pp., 1 pl., [1932. Received August, 1933.]

The studies of the behaviour of streak disease [see preceding abstract] in the P.O.J. 213 variety of sugar-cane, an account of which is given in this paper, afford an insight into the reaction between the virus and a highly resistant host such as this variety.

The P.O.J. 213 cane was introduced into South Africa from the Argentine in 1914, and early in 1926 streak was observed on one plant for the first time. Two more diseased plants appeared in 1928 in the same plot as the first, and six others in 1929 in an adjacent plot. Forty-nine diseased stools were found in a field in the same locality in 1930.

Cuttings from shoots of P.O.J. 213 which were unquestionably streaked sometimes produced only healthy shoots and sometimes shoots which were at first streaked but later recovered, the recovery being, except for a few relapses, apparently permanent. From June or July onwards there was a general tendency for the streaking to increase to a maximum, then from December there was a progressive change towards recovery, until by March the shoots had either recovered or only a few, widely spaced streaks were noted on the youngest leaves. In some cases streak reappeared the following winter, gradually increasing to a maximum and disappearing again in the summer.

In transmission experiments with *Cicadulina mbila* on P.O.J. 213 plants, it was found that during the South African summer and autumn (October to May) the results were largely negative, while as winter approaches (May to July) some condition more favourable to the virus appeared to become established and there were several successful transmissions. In one experiment in which 3 plants out of 9 developed the disease the inoculations were made in March and the first signs of infection appeared in May. In others the incubation period was considerably longer. It appears also that under favourable conditions infection depends partly on the dose of the virus, and that the cumulative action of repeated doses (such as were given in the last-mentioned cases) may be necessary to overcome the resistance of the plant.

DASTUR (J. F.). **Sugar Cane mosaic.**—*Fourth Congress Internat. Soc. Sugar Cane Technologists, 1932, Puerto Rico, Bull. 24, 4 pp., 2 pl., [1932. Received August, 1933.]*

Sugar-cane mosaic was first recorded in India in 1921, when the author observed it at Pusa [*R.A.M.*, iii, p. 364]. Streak was later studied in the Central Provinces, the evidence obtained indicating that it had probably been introduced on canes from the cane-breeding station at Coimbatore, Madras. Further evidence that the disease is not indigenous to the Central Provinces is afforded by the fact that no fresh cases were found in the plots after the affected canes were either destroyed or not used for seed, even though the susceptible varieties were grown year after year.

In the Central Provinces there are ordinarily no secondary effects of streak on standing cane, and no reduction in the yield of molasses. Except for the leaf markings, a diseased crop in no way differs from a healthy one. On one experimental plot streak-infected cane which had been grown as ratoon year after year began to show the secondary symptoms (shortening of the internodes, splitting of the cane, and the development of adventitious roots from the top internodes) only after the sixth year of ratooning.

Notes are given on some cell inclusions found in diseased but

not in healthy canes. They are considered to be foreign bodies and to show certain similarities to those observed by Nelson in bean and other mosaics [ibid., ii, p. 227].

MATZ (J.). **Artificial transmission of Sugarcane mosaic.**—*Journ. Agric. Res.*, xlv, 9, pp. 821-839, 1 fig., 1933.

After a brief review of the literature dealing with the nature of the sugar-cane mosaic virus and its transmission by artificial means [*R.A.M.*, ix, p. 678 *et passim*], the author describes an inoculation method devised by him, in which a drop of inoculum obtained by crushing young mosaic-infected suckers (of the P.O.J. 234 cane in the tests described) is deposited with a pipette in the wedge-shaped opening on healthy canes between the youngest expanded leaf blade and the next younger leaf on the same side of the leaf spindle; a very fine needle, set into a glass rod, is then passed horizontally, or somewhat obliquely downward, through the liquid and into the submerged area of the still rolled leaf, several vertical cuts with the needle being made through the leaf tissue, in order to allow of contact of the virus with the severed fine transverse connections of the vascular bundles. With fresh or properly stored inoculum this method is stated to have given high percentages of infection within a few weeks, although the juice left remaining at the point of inoculation was never protected from the air.

Evidence was obtained that expressed infective juice of the sugar-cane tends increasingly to lose its infectiousness when kept exposed to the air for a day or more at room temperature, or even at temperatures as low as about 4°C. When kept frozen, however, at a temperature of about -6° in open beakers, the juice retained its full infectivity for as long as 27 days. It is advisable, therefore, in inoculation experiments, that the juice should be frozen as soon as feasible after preparation and be kept thus until thawed for use, and also that the grinding and pressing of the infected plant tissues should be done at as low a temperature as possible.

PARISI (ROSA). **Seconda contribuzione alla micologia dell'Italia meridionale.** [Second contribution to the mycology of southern Italy.]—*Bull. Orto Bot. R. Univ. Napoli*, x, pp. 155-175, [? 1932. Received August, 1933.]

This is an additional list of 101 species of fungi, mostly micro-mycetes, which the author has identified since her first communication [*R.A.M.*, iv, p. 313] as occurring in southern Italy, 51 of which are stated to be new records for that region. The following may be mentioned: *Uromyces trigonellae* on the leaves of *Trigonella foenum-graecum*, *Phyllosticta betae* on living leaves of beet, *Phoma chrysanthemi* on *Chrysanthemum indicum*, *Septoria gasparrini* on *Pistacia* sp., *Gloeosporium hesperidearum* on the fruits of *Citrus bigarudia* var. *canaliculata*, *Oidium cynarae* on *Cynara scolymus*, *Septoria ceratoniae*, *Ramularia australis*, and *Cercospora ceratoniae* on *Ceratonia siliqua*, *Helminthosporium inconspicuum* on the leaves of ryegrass, and *H. sesami* on *Sesamum indicum*.

TAI (F. L.) & WEI (C. T.). **Notes on Chinese fungi. II.**—*Sinensia* (*Contr. Metrop. Mus. Nat. Hist. Acad. Sinica*), iii, 4, pp. 93–130, 33 figs., 1932. [Received June, 1933.]

This is an annotated and illustrated list of 27 species of Erysiphaceae which have been recorded on some 90 hosts [an alphabetical list of which is appended] in China.

JENKINS (ANNA E.). **Additional studies of species of *Elsinoe* and *Sphaceloma*.**—*Mycologia*, xxv, 3, pp. 213–220, 2 pl., 1933.

In this paper the writer presents data on the identity, history, and host and geographic range of species of *Elsinoe* and of the form genus *Sphaceloma* [see above, p. 625].

The Italian fungus, *Hadrotrichum populi* [*R.A.M.*, xi, p. 724] var. *arbuti* on *Arbutus unedo*, is recognized as a *Sphaceloma* and as a synonym of *Illosporium mattirolianum*, necessitating the new combination, *S. mattirolianum*. Typical lesions of this fungus were found on phanerogamic herbarium specimens from Germany, indicating the presence of the organism in that country.

The American species *E. ledi* on Labrador tea (*Ledum groenlandicum*) [*ibid.*, xi, p. 184] was described by Peck (*New York State Mus. Bull.* 150, p. 23, 1911) as *Aulographum ledi*, and has since been found on several species of *Ledum* from the east and west of the United States and from Newfoundland. The *Sphaceloma* stage accompanied the perfect form in several collections. In cultures on potato-dextrose agar at constant temperatures, *E. ledi* grew most profusely at 15° to 20° C., while the optima for the other species of *Elsinoe* and *Sphaceloma* are 20° to 25° or above.

The distribution of *S. symphoricarpi* on snowberry (*Symphoricarpos albus* Blake) [= *S. racemosus* Michx.: *ibid.*, ix, p. 723] in Maine, Virginia, and California was ascertained through the examination of dried herbarium specimens of the host from these States.

GADD (C. H.). **The making of Tea cider.**—*Planters' Chron.*, xxviii, 7, pp. 150–151, 1933.

The author states that a good tea cider [see above, p. 597] can be prepared with cultures containing other yeasts than *Saccharomyces ludwigii*, *Bacterium xylinum* being apparently the organism to which the characteristic flavour and odour of the beverage are due. At St. Coombs, Ceylon, brewing takes from two to three days; at higher elevations the process may be longer, at lower ones shorter. When the right flavour has been obtained, the infusion is filtered through a double thickness of linen and bottled. The bottles must be completely filled and securely stoppered, as the liquid is effervescent. As bottling excludes the air, bacterial activity becomes arrested while the yeast continues to work. Tea cider seldom contains over 1 per cent. alcohol, but spirit may be added. The beverage is easily and cheaply brewed at home.

An excellent vinegar can also be made from a sweetened tea infusion, the procedure being the same as in the preparation of tea cider, except that the brew is left in the open vessel for about a month. The vinegar is then strained, boiled, and bottled.

Acetic acid prepared in this way may perhaps be useful for coagulating latex in the preparation of rubber.

[This paper also appears in a slightly expanded form in *Tea Quarterly*, vi, 1, pp. 48-53, 1933.]

JOCHEMS (S. C. J.). **Verslag van het Deli Proefstation over het jaar 1932.** [Report of the Deli Experiment Station for the year 1932.]—*Meded. Deli Proefstat. te Medan-Sumatra*, Ser. II, lxxxiv, 74 pp., 1933.

Some further notes are given on the diseases of tobacco observed or investigated at Deli, Sumatra, in 1932 [*R.A.M.*, xii, p. 470].

VAN BEYMA THOE KINGMA (F. H.). **On some moulds of the genus *Monilia* isolated from Tobacco.**—*Zentralbl. für Bakt.*, Ab. 2, lxxxviii, 5-7, pp. 124-131, 10 figs., 1933.

From Mr. Jollyman, Chemical Laboratory of the Imperial Tobacco Company, Bristol, and Mr. Bunting, Stored Products Research Laboratory, the 'Centraalbureau voor Schimmelcultures', Baarn, Holland, received some cultures of moulds isolated from half or wholly manufactured tobacco leaves. The following were determined by the author as new species: *Monilia cerebriforme*, *M. macrospora*, and *M. microspora*, while for one of the fungi received from Bristol a new combination was made, namely, *M. medouacensis* (Sacc.) van Beyma (*Oospora medouacensis*), which is distinguished from the other species examined by its extraordinarily slow growth. On standard media all these species form budding, hyaline to light-coloured conidia, and at a later stage, articulated, branched hyphae, sometimes producing a tomentose growth. In older cultures thick-walled conidia (sometimes brown) are formed. They are considered to agree with the description of the genus *Monilia* in Engler and Prantl's *Pflanzenfamilien*, i, 1**, p. 424, 1900.

APPEL (O.). **Tomatenkrankheiten** [Tomato diseases.]—*Deutsche Landw. Presse*, lx, 20, p. 247, 1 col. pl., 1933.

Popular notes are given on the occurrence and control in Germany of the tomato diseases caused by *Phytophthora infestans* [*R.A.M.*, xii, p. 549]; *Fusarium acuminatum* [ibid., ix, p. 37], the agent of a rot commencing at the extreme apex and gradually extending over the whole fruit, producing complete mummification; other fruit rots caused by *Phoma destructiva*, *Macrosporium* [*Alternaria*] *tomato* [ibid., xii, p. 121], and *Botrytis cinerea*; bacterial wilt [*Aplanobacter michiganense*]; and stem rot [*Didymella lycopersici*: see next abstract].

BREMER (H.). **Tomaten-Stengelfäule und bakterielle Tomatenwelke.** [Tomato stem rot and bacterial wilt of Tomatoes.]—*Obst- und Gemüsebau*, lxxix, 4, p. 59, 1933.

The stem rot of tomatoes caused by *Didymella lycopersici* [*R.A.M.*, xii, pp. 477, 549] is briefly differentiated from the bacterial wilt due to *Aplanobacter michiganense*. [In a note on p. 58

of the journal it is stated that these are the officially approved popular names for the two diseases, both of which are often erroneously termed 'canker' in Germany.] The former usually appears as a sudden withering of the entire plant, the immediate cause of which is the black rot of the stem base, while the latter is characterized by a more gradual wilting associated with a yellow discoloration and disintegration of the vascular bundles within the stem. Both diseases are transmissible by the seed and pass from plant to plant through human agency, wind, rain, and possibly through the use of infected sticks [see next abstract]. Control measures are indicated, including the immersion of the roots at transplanting in a weak fungicidal solution, e.g., 0.25 per cent. uspulun.

KORDES [H.]. **Tomatenpfähle und Tomatenstengelfäule.** [Tomato sticks and Tomato stem rot.]-*Obst- und Gemüsebau*, lxxix, 4, p. 58, 1933.

During 1932 the writer observed that the sticks up which tomato plants are trained constitute an important source of infection by *Didymella lycopersici* [see preceding abstract]. The spores disseminated in the autumn overwinter in the cracks of the sticks, whence they readily pass to the young plants in the spring. The sticks should be disinfected in 5 per cent. formalin (at least half-an-hour's immersion) and left covered with sacking or the like for two or three days before use.

HOFFMAN (I. C.). **Potash starvation in the greenhouse.**-*Better Crops with Plant Food*, xviii, 6, p. 10, 4 figs., 1933. [German abs. in *Ernährung der Pflanze*, xxix, 13, pp. 256-257, 1933.]

Tomato and cucumber plants in Ohio glasshouses were found to suffer from potash deficiency, resulting in discoloration of the leaves from the base upwards, crinkling of the interveinal areas (where an excess of nitrogen was given), necrotic spotting and brittleness of the foliage, thin, spindling stems and tendrils, and (in the case of tomato) brown stripes on the stems, petioles, and main leaf veins. The fruits of affected tomato and cucumber plants were irregular in shape, those of the former being also poorly coloured. Recommendations for potash manuring are given.

TUBEUF [C. v.]. **Studien über Symbiose und Disposition für Parasitenbefall sowie über Vererbung pathologischer Eigenschaften unserer Holzpflanzen. I. Das Problem der Hexenbesen.** [Studies on symbiosis and tendency to parasitic infection and on the inheritance of pathological characters in our woody plants. I. The problem of witches' brooms.]-*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xliii, 5, pp. 193-242, 60 figs., 1933.

The author considers that the witches' brooms of woody plants (some 60 of which are illustrated from photographs) may be regarded as dense, upward-growing branch systems parasitizing the normally branched host in the same way as mistletoe or *Loranthus* bushes.

Witches' brooms may be classified in the following groups [cf. *R.A.M.*, vi, p. 706]. A. Symbiotic witches' brooms caused by parasites: I. By parasitic plants, (1) higher plants, represented by *Arceuthobium* spp., and (2) lower plants (fungi belonging to the Exoascaceae, Uredinales, and Ustilaginales). II. By parasitic insects (or mites). B. Witches' brooms developing without parasitic stimulus, a marked feature of which, in addition to the absence of pathogenic organisms, is the transmissibility of shape and slowness of growth to the progeny. In the witches' brooms of this type studied by the author from 1907 onwards, chiefly on *Picea excelsa*, a certain percentage of the progeny of affected trees form the brooms and remain dwarfed. It is probable that the majority of the dwarfed forms reported in the literature arise in this manner.

A striking instance of adaptation to the symbiotic mode of life is afforded by the witches' broom caused by *Caeoma deformans* on *Thujaopsis dolabrata* [ibid., vi, p. 233]. The fungus produces a subspherical structure composed of leafless, profusely ramified shoots with a brown bark, attaining the size of a head. In this case the entire witches' broom is at the service of the parasite, to which it transfers the nourishment supplied to it by the host. A somewhat similar condition occurred in an antler-shaped witches' broom recorded by the writer (*Naturw. Zeitschr. für Forst- und Landw.*, p. 401, 1913) on *Laurus nobilis*, the causal organism being *Exobasidium lauri*. This formation resembled the gall described on *Aspidium aristatum* as caused by *Taphrina cornu-cervi*.

Witches' broom parenchyma is full of starch, so that assimilatory chlorophyll must be present, at any rate in the subtending leaf; differentiated epidermal cells and stomata are, however, not formed.

GUINIER (P.). **Sur la biologie de deux champignons lignicoles (*Stereum purpureum* Pers. et *S. hirsutum* (Wild.) Pers.).** [On the biology of two lignicolous fungi (*Stereum purpureum* Pers. and *S. hirsutum* (Wild.) Pers.).]—*Comptes rendus Soc. de Biol.*, cxii, 13, pp. 1363–1366, 1933.

Stereum purpureum is commonly found on felled beech, birch (*Betula alba*), poplar, hornbeam (*Carpinus betulus*), and other wood, while *S. hirsutum* occurs mainly on oaks (*Quercus pedunculata* and *Q. sessiliflora*). However, in a forest near Autun, Saône-et-Loire, *S. hirsutum* was observed in 1931 on beeches from which the bark had fallen in consequence of a fire two years previously, while *S. purpureum* was absent. The latter fungus can only invade wood of which the living cells (woody parenchyma and medullary rays) are still intact and contain reserve materials; hence its localization in the young, peripheral layers and cessation of growth after about a year when the reserves in this region are exhausted. The inability of *S. purpureum* to infect oaks may be attributed to the tannin content in these trees [cf. *R.A.M.*, viii, p. 261]. *S. hirsutum*, on the other hand, can attack the wood in the absence of all living matter and feed on the membranes for a number of years, causing serious decay of the sapwood [ibid., xi, p. 343]. In competition with the more rapidly growing *S. purpureum*, *S. hirsutum* is liable to be suppressed, but it develops

under conditions adverse to the activity of the former, e.g., on wood that has been felled for some time and on dead branches.

BUISMAN (CHRISTINE). **Verslag van de onderzoeken over de Iepen ziekte, verricht in het Phytopathologisch Laboratorium Willie Commelin Scholten te Baarn, gedurende 1932.** [Report of the investigations on the Elm disease conducted in the Phytopathological Laboratory 'Willie Commelin Scholten' at Baarn during 1932.]—*Tijdschr. over Plantenziekten*, xxxix, 4, pp. 77-94; 5, pp. 101-113, 1 pl., 1933.

Further experiments [the results of which are fully tabulated and discussed] on the reaction to *Ceratostomella ulmi* of a large number of European, Asiatic, and American elm species and varieties [*R.A.M.*, xii, p. 541] showed that the most promising in the first group are *Ulmus foliaceus* with its varieties *dampieri* and *wredei*, *U. glabra* and its var. *fastigiata*, *U. hollandica* [var.] *vegeta*, *U. procera* [var.] *monumentalis* Rinz, and *U. procera* [var.] *berardi*. The American species proved so highly susceptible that further tests on this group appear superfluous. Some degree of resistance was shown by the following Asiatic forms: *U. sp.* from Karagatch, *U. laciniata* [var.] *nikkoense*, *U. parvifolia* (comprising *U. sieboldii* and *U. shirasawana* according to Rehder's system of classification), *U. wilsoniana*, and *U. pumila* and its var. *pinnatoramosa*.

Inoculation experiments with *C. ulmi* on ash, *Robinia pseud-acacia*, and *Celtis occidentalis* gave negative results. The fungus was reisolated from branches of beech, alder, oak, *C. orientalis*, and lime [*Tilia*] at points ranging from immediately above the site of inoculation (alder) to 35 cm. above it (lime). *Verticillium albo-atrum* was isolated from a number of trees and shrubs exhibiting symptoms suggestive of die-back at Baarn in 1932, including ash and *Robinia pseud-acacia* [*ibid.*, xi, p. 275], while *C. ulmi* was isolated only from a diseased *Zelkova serrata* [*ibid.*, xi, p. 484].

The inability of *C. ulmi* to penetrate unwounded elm roots was shown by a test in which seedlings of *U. glabra* were repeatedly watered with a spore suspension of the fungus without result, whereas those inoculated through the roots by injection with a syringe developed the typical discoloration of the wood.

Perithecia of *C. ulmi* developed on the bark of three out of five diseased elms at De Bilt, but were found on only one out of four felled trees at the Hague. It is considered that their formation is not a regular feature in the life-history in nature.

Inoculation experiments were carried out with *C. quercus* from oak [*ibid.*, vii, p. 286] on *U. americana* and oak, *C. fagi* from beech on *U. americana* and beech, and *C. pluriannulata* + and - [*ibid.*, ix, p. 76], found by Mrs. Gregor on an elm killed by die-back, on *U. americana*. Discoloration of the wood developed only on two branches inoculated with *C. pluriannulata*, but isolations from this material yielded *V. albo-atrum*. *C. quercus* was reisolated from inoculated elm and oak branches and *C. fagi* from those of elm and beech, but only near the point of infection and there is so far no evidence that they are able to cause disease.

ALEXANDRI (A. V.). **Uscarea Ulmilor în România.** [The Elm disease in Rumania.]—Reprinted (1933) from *Bul. Soc. Stud. Ştiinţe Nat.*, Bucharest, iii, 16 pp., 7 figs., 1932. [French summary.]

In giving a brief survey of the literature dealing with the etiology and morphology of the Dutch elm disease (*Ceratostomella ulmi*) [see preceding abstract] the author states that since its first discovery in Rumania in 1929 it has spread practically over the whole of the country, where it attacks the two indigenous species *Ulmus campestris* and *U. montana*, and the imported *U. americana* which is planted along the streets and roads. Owing to the difficulties presented by control measures he recommends the replacement of the diseased elms by resistant or immune trees. The paper also includes a list of other fungal diseases of the elm, including the leaf and twig parasite *Sphaeropsis nervisequa* described from Germany by Lang (*Ber. Deutsch. Dendrol. Ges.*, xxxv, 1, p. 37, 1917) which the author suggests renaming *Haplosporella nervisequa* comb. nov., since according to Petrak and Sydow [*R.A.M.*, v, p. 331] all the species of *Sphaeropsis* with one-celled, oval or elliptical spores, devoid of a gelatinous envelope, such as occur in this fungus, should be referred to the genus *Haplosporella*.

HÅRD AV SEGERSTAD (F.). **Till frågan om värdväxterna för *Uncinula adunca* (Fr.) Lév.** [On the question of the host plants of *Uncinula adunca* (Fr.) Lév.]—*Svensk Bot. Tidskr.*, xxvi, 3-4, pp. 464-465, 1932.

Willows (*Salix caprea*) in Dalsland, Sweden, were observed by the writer in the late summer of 1932 to be heavily parasitized by *Uncinula adunca* (Fr.) Lév. (= *U. salicis* (DC.) Wint.) [*R.A.M.*, v, p. 15; ix, pp. 408, 568]. A list is given of the hosts of this mildew known in Scandinavia.

KRAVITZEFF (B. I.). **Грибные болезни Сибирской Пихты.** [Diseases of the Siberian Pitch Fir.]—Pamphlet issued by *Омское Бюро Общ. Краеведения* [*Omsk Bureau Soc. Regional Knowledge*], Omsk, 30 pp., 11 figs. (one on title-page), 1 map, 1933.

Among the 115 species of parasitic and saprophytic fungi listed in this paper as having been so far recorded on the Siberian pitch fir (*Abies sibirica*), those responsible for bole and heart rots are discussed most fully owing to their widespread nature and to the considerable financial losses they cause in many localities of Siberia, frequently resulting in the rejection of over 50 per cent. of the logs felled for constructional purposes or as mine props. These include *Fomes robustus* f. *pinuum* which is stated to be frequent in Siberia only on *A. sibirica* and to be found chiefly on trees attacked by other fungi, especially the rust *Melampsorella cerastii* which is widespread and causes witches' brooms and canker lesions on the fir: in the Russian Far East *F. robustus* f. *pinuum* is however frequently found also on *Picea ajanensis*. In the north of Siberia young pitch firs suffer severely from attacks of the rust *Calyptospora goeppertiana* [*R.A.M.*, ix, p. 420].

LIESE (J.). **Brunchorstia destruens Eriks., Erreger des Triebsterbens der Kiefer.** [*Brunchorstia destruens* Eriks., the agent of the die-back of Pine shoots.]—*Forstarchiv*, 1933, 10, pp. 170-171, 2 figs., 1933.

Recent studies on *Brunchorstia destruens*, the causal organism of the die-back of pine shoots in Germany, show that this fungus is not genetically connected with *Cenangium abietis* as previously supposed [*R.A.M.*, x, p. 699]. For four years the olive-green mycelium derived in pure culture from the pycnidia of *B. destruens* from diseased pine branches have failed to produce apothecia, and conversely, the apothecia of *C. abietis* give rise to a white mycelium with different characters from that of *B. destruens*. [Jørgensen has shown [*ibid.*, x, p. 272] that the perfect stage of *B. destruens* is *Crumenula abietina*.]

WEESE (J.). **Über den Nadelschüttepilz von *Pinus strobus*.** [On the fungus causing leaf fall of *Pinus strobus*.]—*Mitt. Bot. Inst. Tech. Hochschule Wien*, ix, 1, pp. 22-24, 1932. [Received July, 1933.]

The author states that when investigating the cause of leaf fall of *Pinus strobus* in Silesia in 1929 he compared Tubeuf's authentic material of *Hypoderma brachysporum* (Rostr.) Tub. (1902) with the original sample of *H. desmazierii* Duby (1861), with the conclusion that both are identical. The fungus should, therefore, be known under the latter name, with *Lophodermium brachysporum* Rostrup 1883, *H. brachysporum*, and *H. strobicolum* Tubeuf 1897 as synonyms [cf. above, p. 604].

H. lineare Peck, which also occurs on the needles of *P. strobus*, is distinct from *H. desmazierii* and, according to von Höhnelt, should be referred to the genus *Bifusella*.

LAGERBERG (T.). ***Ascochyta parasitica* (Hartig), en skadesvamp på Granplanter.** [*Ascochyta parasitica* (Hartig), a parasitic fungus on Spruce plants.]—*Svenska Skogsvårdsfören. Tidskr.*, xxx, 1, pp. 1-10, 3 figs., 1933. [English summary.]

One-year-old spruce (*Picea excelsa*) seedlings at the State Institute of Experimental Forestry, Stockholm, were extensively attacked in the autumn of 1930 by *Ascochyta parasitica* (*A. piniperda*), not hitherto observed in Sweden.

Infection takes place on the current year's shoots, the basal parts of which turn brown while the upper portions, though temporarily remaining green, lose their turgescence and droop. Ultimately the mycelium permeates and kills the shoots. In one-year-old seedlings the needles of affected shoots do not drop prematurely, as in older trees, and the pycnidia of the fungus therefore develop on them. The writer's observations on the morphology of *A. piniperda* agree in the main with those of Hartig, except that the conidiophores are branched. The severe damage reported to be caused by the fungus in Germany is not considered to be proved, and some other agent is thought to have been involved.

PIERSON (ROYALE K.). **Fusion of pycniospores with filamentous hyphae in the pycnium of the White Pine blister rust.**—*Nature*, cxxxi, 3316, pp. 728–729, 1933.

From the crust-like stromatic layer characteristic of the subcortical pycnidia of the white pine blister rust [*Cronartium ribicola*] arise slender, erect pycnidiophores, closely compacted in a palisade arrangement and accompanied by an occasional filamentous hypha projecting some way above the common level reached by the pycnidiophores. The structure of the hypha is similar to that of the pycnidiophores, but it usually exceeds the latter in diameter and is more irregular in outline. No cross walls have been observed in these hyphae, which usually contain a single nucleus near the base. The tips of such hyphae are often bent over into a procumbent position due to the pressure of the overlying host cells. The occurrence of this type of hypha was first reported by R. H. Colley (*Journ. Agric. Res.*, xv, p. 619, 1918).

A cytological study was made at the Idaho School of Forestry of stained and fixed pycnidia of *C. ribicola*, fertilized by the interchange of pycniospores, and of an equal number of unfertilized pycnidia of similar age. Eleven cases of fusion between pycniospores and the above-mentioned filamentous hyphae were observed, whereas no instance of such a process was detected in the sterile material. The pycniospores were united to the ends of the hyphae by short tubes, longer and somewhat narrower than those figured by Craigie for sunflower rust [*Puccinia helianthi*: *R.A.M.*, xii, p. 318]. A few of the pycniospores were apparently empty, while others contained nuclei in the usual site. Actual migration of nuclei was not observed.

CHAPMAN (A. D.) & SCHEFFER (T. C.). **New chemical treatments for the control of sap stain and mold in Southern Pine and hardwood lumber.**—Reprinted from *The Southern Lumberman*, 4 pp., 1 fig., 15th May, 1933.

A tabulated account is given of the writers' continued tests in Louisiana in 1932 on the control of sap stain [*Ceratostomella* spp.] on southern pine [*Pinus palustris*] and hardwoods, including sap gum [*Liquidambar styraciflua*], yellow poplar [*Liriodendron tulipifera*], oak, beech, and black gum [*Nyssa sylvatica*: *R.A.M.*, xi, p. 816; xii, p. 411].

The best results in commercial scale tests were given by lignasan (0.25 per cent.) and sodium tetrachlorophenolate (0.3 per cent.), which reduced the incidence of stain to under 1 per cent. LE-3 (an ethyl mercury oleate preparation, 0.24 per cent.) and a mixture of sodium tetrachlorophenolate and sodium 2-chloroorthophenylphenolate (0.3 per cent. of each) ranked next in general efficacy, while the latter compound (known as SCOPP) alone gave satisfactory results with all the woods except *L. styraciflua*. In the case of pine SCOPP, either alone or mixed with sodium tetrachlorophenolate (STCP), was definitely superior in the control of stains and mould to lignasan, LE-3, or STCP alone. In withstanding washing out SCOPP was better than LE-3 or lignasan in pine, while STCP was the best for sap gum.

Used at the rate of 1.5 or 3 per cent. as a spray for pine export timbers, SCOPP gave very satisfactory results against stain and mould, 90 per cent. of the treated pieces reaching London in good condition. In another test on partially seasoned pine dipped in lignasan (0.37 per cent.) at the mill but not re-treated on loading, there was about 25 per cent. stain on arrival at Havana after 11 days in transit, the corresponding figure for LE-3 (0.5 per cent. on loading) being 10 per cent.

The corrosive action of the chemical compounds on the equipment may be obviated by the addition of alkali to the solution, which likewise prevents the iron tannate discoloration that is liable to develop in treated oak timber.

Dry rot in wood.—*Dept. of Sci. and Indus. Res., Forest Products Res. Bull.* 1 (2nd Edit.), 34 pp., 9 pl., 2 diags., 1933.

In the first part of this bulletin (written by K. St. G. Cartwright and W. P. K. Findlay) *Fomes cryptarum*, *Lentinus lepideus*, and *Stereum frustulosum* are added to the list given in the original edition [*R.A.M.*, viii, p. 79] of the fungi that cause dry rot of constructional timbers in England, and brief notes are given on the nature of the decay caused by them. The second section, contributed by H.M. Office of Works, London, deals with the detection and practical treatment of dry rot, and in the third, contributed by the Building Research Station of the Department, the precautions are discussed, which are to be taken to prevent outbreaks of dry rot in new buildings.

HEDGCOCK (G. G.). The prevention of wood-staining in basket veneers.—*Journ. of Forestry*, xxxi, 4, pp. 416-420, 1933.

A tabulated account is given of the writer's laboratory and factory experiments on the efficacy of a number of chemicals against the staining of hardwood veneer baskets by fungi, including *Ceratostomella pluriannulata* [see above, p. 665], *Ceratostoma rugosa* Hedge. n. sp. pro tem. [no diagnosis], *Cladosporium*, *Graphium*, *Hormodendron*, and *Hormiscium* spp., besides various moulds forming unsightly blotches on the surface of the wood.

Freshly cut staves from stain-free logs were used in all the tests, the results of which showed that the following were the most effective treatments in the factory: 3 per cent. each of borax and boric acid and 8.5 per cent. sodium carbonate; 10 per cent. lime and 10 per cent. sulphur; 0.1 per cent. mercuric chloride and 0.2 per cent. hydrochloric acid; 10 per cent. potassic alum; 0.3 per cent. phenyl salicylate (salol); 10 per cent. sodium bicarbonate; and 10 per cent. sodium carbonate. Of these compounds the lime and sulphur mixture is the cheapest.

STIMSON (E.). Does it pay to treat timber?—*Railway Engin. & Maintenance*, xxix, 4, pp. 184-186, 189, 1 fig., 1933.

Various instances are cited of the early preservative treatment of bridge timber in the United States from 1875 onwards [cf. *R.A.M.*, xii, p. 70], including the Lake Pontchartrain trestle bridge, finished in 1883, a recent inspection of which showed that some 50

per cent. of the original creosoted yellow pine [*Pinus palustris*] timber is still in use. The writer's own experience on the Baltimore and Ohio Railway dates back to 1910, when a ballast-deck pile trestle was treated with creosote by the Lowry process, the red oak [*Quercus rubra*] piling with an average retention of 10.6 lb. per cu. ft., and the yellow pine remaining portions at 9.2 lb. So far there has been no outlay on repairs.

In 1913 the Baltimore and Ohio Railway started treating sleepers by the Card process [ibid., xi, p. 815], using a mixture of $\frac{1}{2}$ lb. dry zinc chloride and 3 lb. water-gas tar per cu. ft.; in 1927 this method was superseded by a creosote-petroleum mixture and the Rueping process [loc. cit.] from which at least 20 years' service is anticipated. In 1900, only 2,800,000 sleepers, or 3.2 per cent. of the 85,000,000 used were treated. By 1910 the number had increased to 30,544,000 or 20.6 per cent. of the total of 148,231,000. In 1920, 43.5 per cent. of the sleepers were treated, and in 1930, 78.5 per cent., nearly all with creosote.

Records of the renewals on 27 of the principal American railways show that in 1911 they were 262 sleepers per mile, while by 1931 this figure had fallen to 117, a reduction of 145 sleepers per mile or 29,071,340 for all the 27 railways, with an estimated cash saving of \$26,635,337.

RATH (L.). Erfahrungen bei der Bekämpfung der Kohlhernie. [Observations in the control of finger-and-toe disease of Cabbage.]—*Obst- und Gemüsebau*, lxxix, 4, p. 63, 1933.

Treated seed of the red cabbage variety Später holländischer [Late Dutch] Export, the white Brunswick, and the Westländer Brussels sprouts was sown in a field under uniform conditions. The first-named variety remained almost completely free from finger-and-toe disease [*Plasmodiophora brassicae*], which was very severe, however, on both the other sorts [cf. above, p. 608].

TEDIN (O.). Nedärvningen av resistens mot klumprotsjuka (*Plasmodiophora brassicae*) hos Rova (*Brassica rapa* v. *rapifera*) i förhållande till vissa morfologiska rotkaraktärer. [The inheritance of resistance to finger-and-toe disease (*Plasmodiophora brassicae*) in Turnips (*Brassica rapa* v. *rapifera*) in relation to certain morphological root characters.]—*Nordisk Jordbruksforskning*, xiv, pp. 324-331, 1932. [Abs. in *Plant Breeding Abstracts*, Imperial Bureau of Plant Genetics, iii, 4, pp. 192-193, 1933.]

A Danish turnip, Marienlyst V, resistant to finger-and-toe disease (*Plasmodiophora brassicae*), was crossed in Sweden with two susceptible Swedish strains, Weibull's Pedigree Bortfelder and Rodtoppiga [red-topped] Bortfelder, the latter not yet on the market [*R.A.M.*, iv, p. 389]. The resistant variety is characterized by short, flat roots in contrast to the long ones of the susceptible strains, and this character was reproduced among the progeny of the crosses in such a way as to suggest a linkage between the factors determining shape and those involved in resistance.

HORSFALL (J. G.) & KERTESZ (Z. I.). **Abnormal enlargement of Peas from plants affected with root-rot.**—*New York (Geneva) Agric. Exper. Stat. Bull.* 621, 20 pp., 6 graphs, 1933.

The results of the investigation reported in this paper, which was conducted in 1931 and 1932, established the fact that peas produced on plants affected with root rot (involving a number of organisms, among which *Rhizoctonia* [*Corticium*] *solani* appeared to be very largely responsible for the disease in 1931, while *Pythium* spp. were probably the most important in 1932) developed to larger dimensions as determined both by sieve-passing capacity and volume per pea than those on healthy plants, under normal soil moisture conditions; in drier soils the peas on root-diseased plants shrivelled prematurely and remained smaller than normal. There was clear evidence that the larger size of the diseased peas was due to a more rapid rate of growth rather than to any difference in the blossoming date of the diseased and healthy plants.

LAURITZEN (J. L.), HARTER (L. L.), & WHITNEY (W. A.). **Environmental factors in relation to Snap-Bean diseases occurring in shipment.**—*Phytopath.*, xxiii, 5, pp. 411–445, 4 graphs, 1933.

A fully detailed and tabulated account is given of the writers' investigations at the Arlington Experiment Farm, Virginia, on the factors affecting various transit diseases of beans (*Phaseolus vulgaris*) [*R.A.M.*, xii, p. 71].

The following pathogens were used: *Colletotrichum lindemuthianum* from beans, *Bacterium phaseoli* from beans and Lima beans [*P. lunatus*], *Sclerotinia sclerotiorum*, *Pythium butleri* [*ibid.*, xi, p. 218], *Rhizopus tritici* [*ibid.*, vii, p. 2], and *R. nigricans* from sweet potato [*ibid.*, x, p. 269], *Rhizoctonia* [*Corticium*] *solani* and *Sclerotium rolfii* from beans, and *Botrytis cinerea* from pepper [*Capsicum annuum*].

The beans (chiefly Bountiful from Florida) were stored either in ventilated insulated or galvanized iron chambers with controlled temperature and humidity.

C. lindemuthianum can infect beans at temperatures from about 7° to 33° C., the optimum being from 22° to 25° at which and at 27° the incubation period is 5 days, compared with 7 at 15.5° and 17.5°, 9 at 12°, 12 at 10°, and 14 at 7°.

Infection by *Bact. phaseoli* was obtained only through needle pricks at a temperature range of 2° to 31°. The development of blight lesions was observed in apparently healthy beans from diseased stocks at a range of 1.2° to 35°. *S. sclerotiorum* caused infection between 0° and 28°, the optimum lying between 19° and 24°. The earliest infection at 12° was observed in 4 days and at 0° in 15. *P. butleri* was infective between 12° and 35.6°, the optimum being about 31°. Infection by *C. solani* took place at a range of 0.9° to 35.5°, with an optimum at 24° to 32°; the incubation periods were 20 days at 0.9° and 2° and 16 at 5.5° and 8°. *S. rolfii* infected beans at 8° to 35.6°; at the former degree and 12°, however, only after 11 days' storage. Infection by *R. tritici* and *R. nigricans* was found on beans exposed to temperatures above 30°; below 12° the infection is usually very slight. Infec-

tion by *B. cinerea* occurred between 0° and 35.5°, the incubation periods being 4 days at 12° to 35.5°, 6 at 6° and 8°, and 15 at 0°.

Deterioration of beans, apart from that due to micro-organisms, is very rapid at temperatures above 20°, especially at 35.5°. In bean consignments sent from Florida to Washington, the quality remained good for 4 to 15 days at 6° to 7° and for 6 to 15 at below 6°. Taking into consideration both the quality of the beans and the diseases likely to occur in transit, shipment at temperatures below 10° is recommended.

LINK (K. P.) & WALKER (J. C.). **The isolation of catechol from pigmented onion scales and its significance in relation to disease resistance in Onions.**—*Journ. Biol. Chem.*, c, 2, pp. 379-383, 1933.

From the outer scales of pigmented Californian onions the writers isolated catechol (3, 4-dihydroxybenzene), a substance that is absent from the same parts of the white varieties [*R.A.M.*, xi, p. 561]. Catechol was found to be somewhat more toxic than protocatechuic acid [*ibid.*, x, p. 701] to the causal organism of smudge (*Colletotrichum circinans*), as demonstrated by the addition of varying amounts of each to a modified Czapek's solution. Thus, the growth of the fungus was inhibited by 1 part of the acid to 800 of the medium, while 1 of catechol to 1,600 sufficed to produce the same result. When spores of *C. circinans* were placed in a solution of 1 part of protocatechuic acid to 1,600 of water, abnormal germination occurred, while in the case of catechol no growth took place at 1 in 1,600 and retardation was observed at 1 in 3,200.

Legislative and administrative measures. Portugal.—*Internat. Bull. of Plant Protect.*, vii, 5, pp. 109-110, 1933.

Under Presidential Decree No. 22:389 of 29th March, 1933, seeds, plants, and parts thereof imported into Portugal must be accompanied by official certificates of origin vouching for the freedom of the consignments from potato wart (*Synchytrium endobioticum*), which must further be absent from the area within a 5 km. radius of the place of cultivation [*R.A.M.*, xi, p. 272; xii, p. 127]; for the absence from the region of origin of *Bacillus amylovorus* [on Rosaceae], *Endothia parasitica* [on chestnut], and court-noué [on vine]; and for the freedom of any plant within a radius of 5 km. from the place of cultivation from attack by *Phytophthora cambivora*. Some small centres of potato wart having been detected in the north of Portugal, the usual measures have been prescribed by Presidential Decree No. 22:463 of 8th April, 1933, to eradicate the disease.

Legislative and administrative measures. Latvia.—*Internat. Bull. of Plant Protect.*, vii, 5, p. 109, 1933.

A Decree of the Minister of Agriculture, dated 2nd December, 1932, provides for the destruction of barberry (*Berberis vulgaris*) [against *Puccinia graminis*] and of buckthorn (*Rhamnus cathartica*) [against *P. lolii*], originally ordered by the Law of 20th March, 1930, to be completed by 20th March, 1935.